

Defense Transformation and Network Centric Warfare

**Presentation to
NCW Education Workshop
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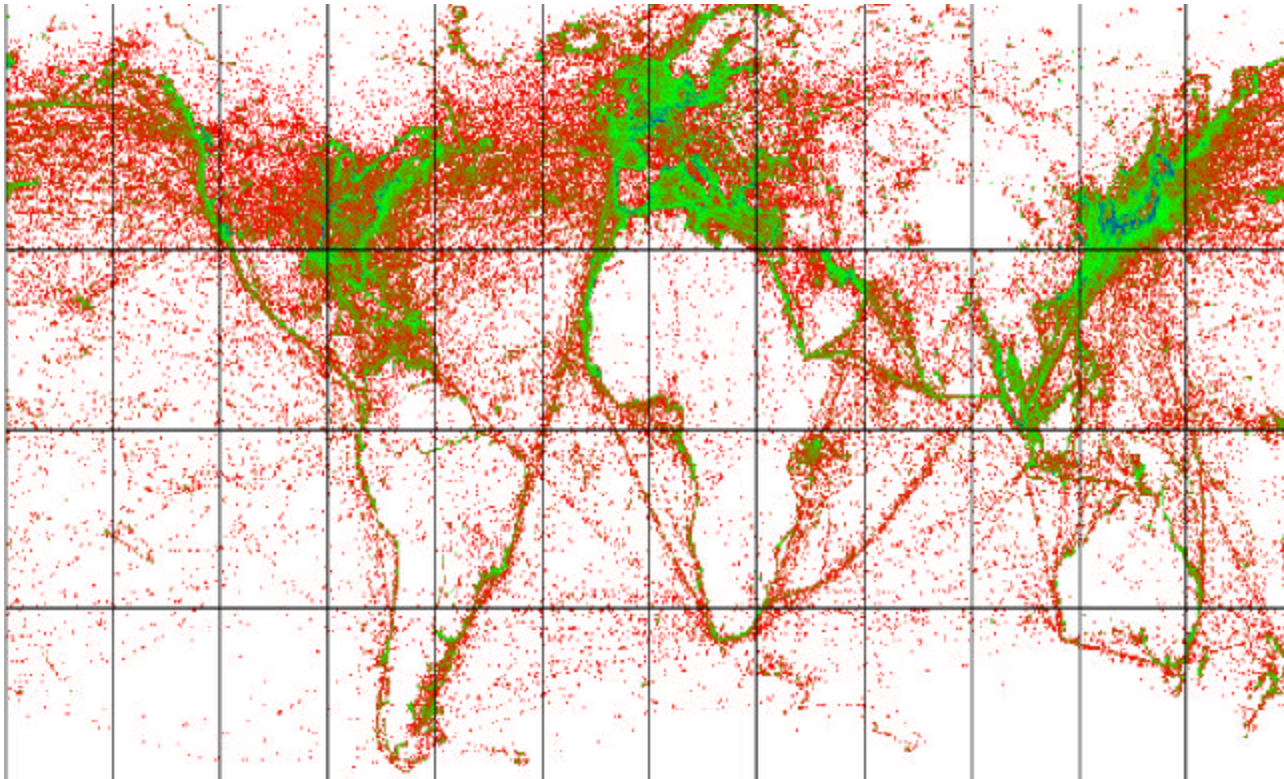



Objective

- **Help You Understand:**
 - *Global Trends*
 - *New Strategic Context*
 - *Warfighting Innovation*
 - *Strategy for Defense Transformation*
 - *Network Centric Warfare (NCW)*
 - *Emerging NCW Implementation Strategy*

Global Trends

Globalization II  **Globalization III**



Industrial Age  **Information Age**

Global Trends

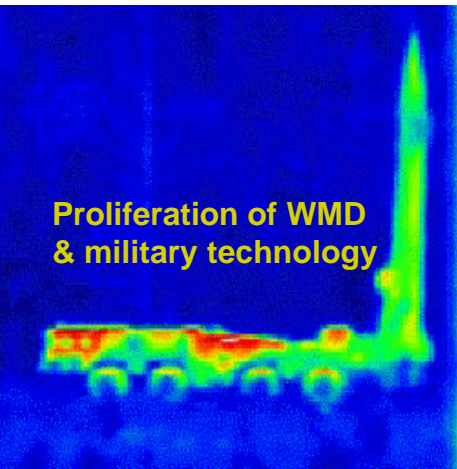
Globalization II



Globalization III

- Static, bipolar “market”
- Bulk of population in 3rd World
- Limits on security “exports”
- **Beliefs in Conflict: Political Ideology**
- Ordering principle = Great Power War; yet none since 1945

- Also bifurcated, but very fluid
- 4 Billion in Core, 2 Billion in Gap
- “Unlimited” global demand for security exports
- **Beliefs in Conflict: Religion/culture**
- Warfare now simultaneous across system, state and individual levels

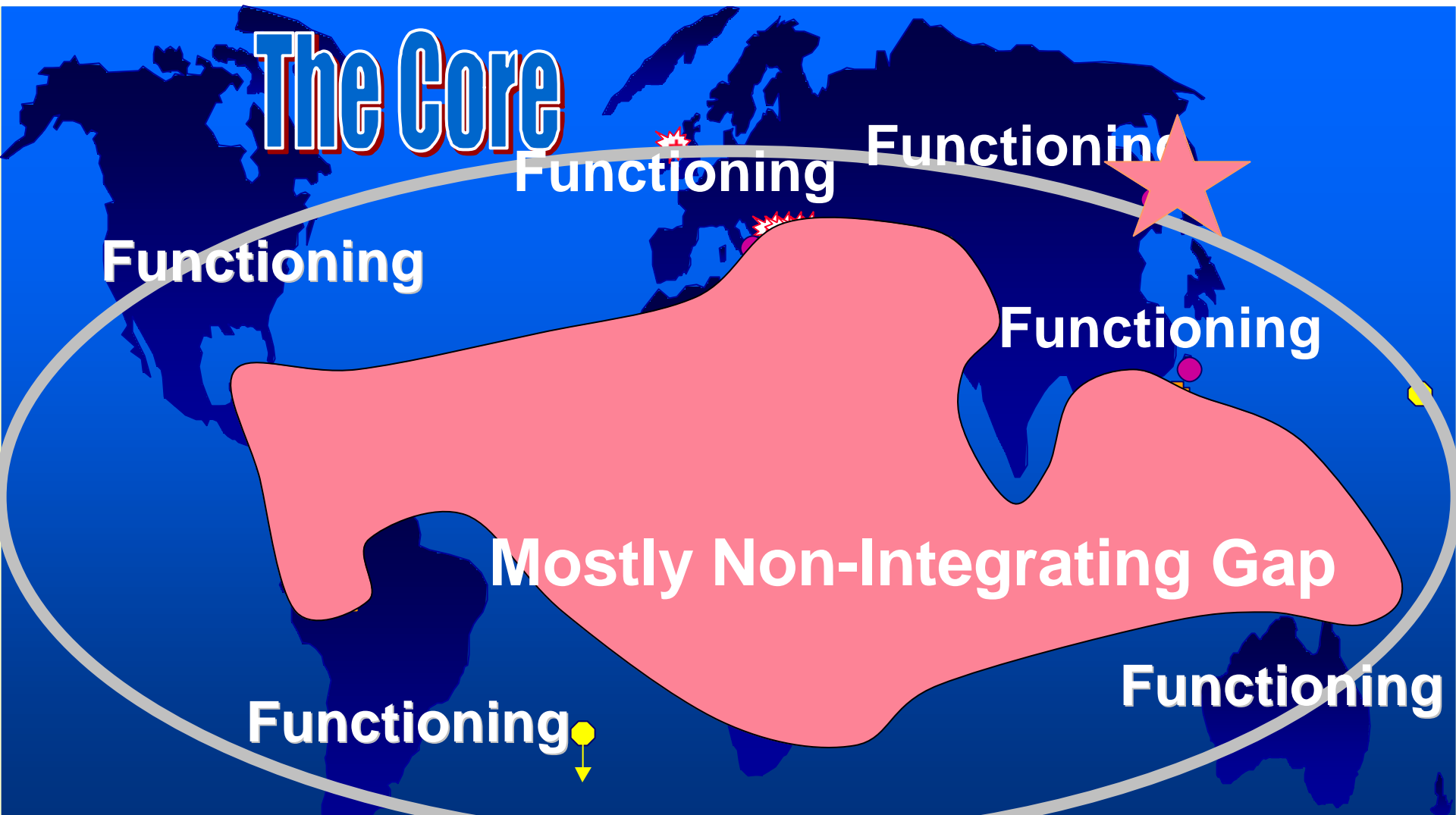


Proliferation of WMD
& military technology

- *New Rules*
- *New Institutions*
- *New Security Environment*
- *Disconnectedness* → *Danger*



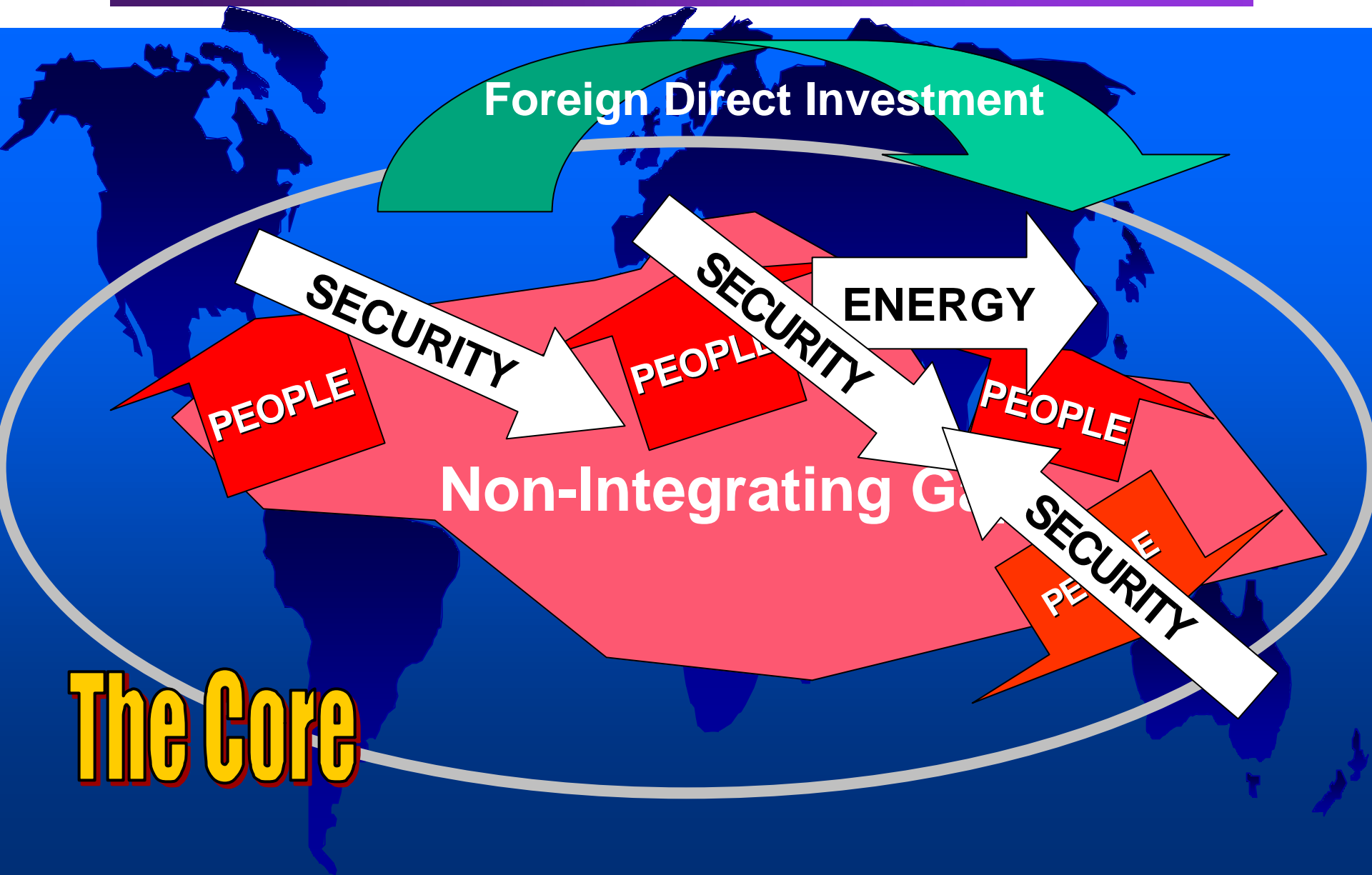
Globalization III



U.S. Military Responses to Situations, 1990-2002



Globalization III: Major Flows



Global Trends

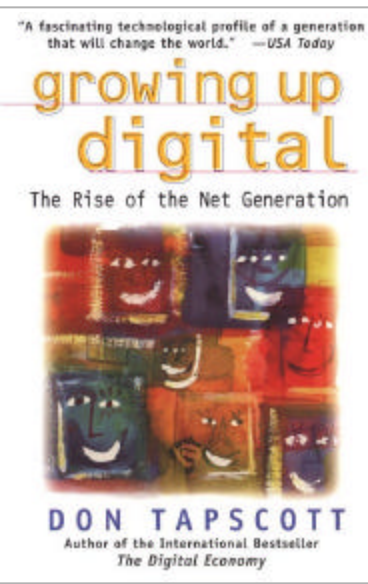
Industrial Age

- Success = Scale + Scope
- Top Down - Centralized
- Vertical Integration
- Information Hoarding
- Local Awareness
- Arms Length Relationships
- Make and Sell
- Inwardly Focused



Information Age

- Success = Adaptability + Agility
- Empowering the “Edges”
- Virtual Integration
- Information Sharing
- Increased Transparency
- Collaboration & Synchronization
- Sense and Respond
- Externally Oriented
- Accelerated Innovation & Experimentation



- *New Rules*
- *New Behaviors*
- *New Competencies*
- *New Relationships*

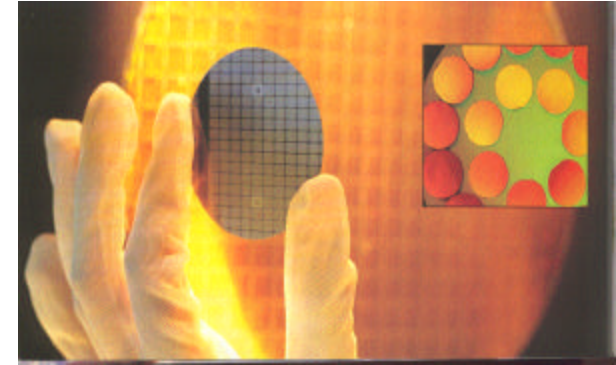


Global Trends Create a New Competitive Landscape

Information Age

- **New Technological Context**

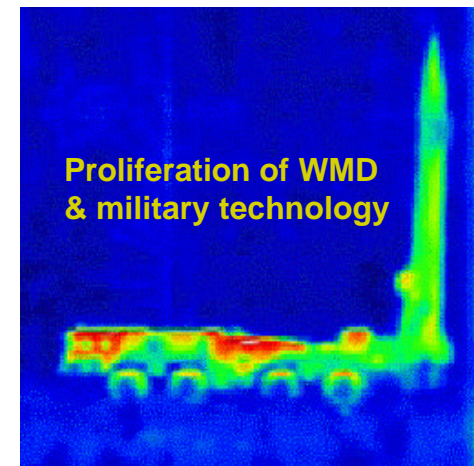
- Access to highly capable, low-cost IT
- Falling barriers to competitive entry -- sea, space, cyberspace



Globalization III

- **Broadened Threat Context**

- Era of uncertainty with rapidly evolving threats
- State/non-state, nodal/non-nodal
- Asymmetric / conventional
- Unrestricted – deterring the un-deterable



Global Trends Create a New Competitive Landscape

Information Age

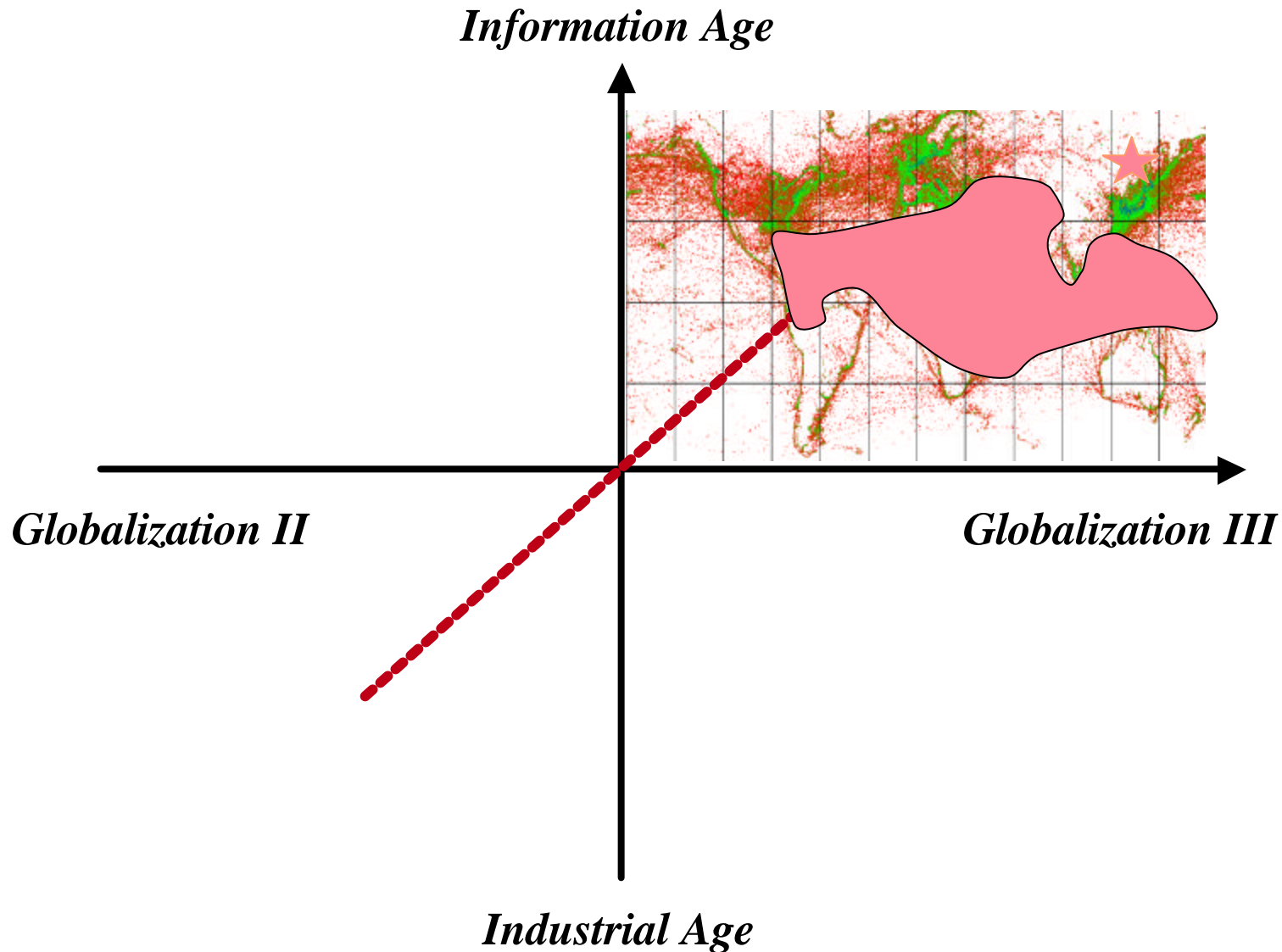
- *New Strategic Context:*

- *Information Age principles & phenomena changing character of competition*
- *Era of globalization – a changed international landscape*
- *New relationship between operations abroad and homeland security*

Globalization III

*To the degree we do not transform,
we are strategically a fixed-target and therefore at risk*

Transformation: Meeting the Challenges of the New Competitive Landscape



The New Competitive Landscape: A UK Military Perspective

Operational Environment

Cold War

- Single Threat
- Single Mission
- Known Theatre of Operations
- Stable Formation Groupings
- National Corps
- Stable National C2 Arrangements

Certainty + Predictability

Today +

- Multiple and Unknown Threats
- Multiple and Unpredictable Missions
- Unknown Theatre of Operations
- Force Packaging
- Multi-national Force Elements
- Variable Multi-national C2 Arrangements

Uncertainty + Unpredictability

Source: Presentation to *NCW Europe* by Brigadier Geoff Sheldon, Director Land Digitization

Transformation

...Elements

- ✓ Continuing process
- ✓ Creating/anticipating the future
- ✓ Co-evolution of concepts, processes, organizations and technology
- ✓ New competitive areas / competencies; revalued attributes
- ✓ Fundamental shifts in underlying principles
- ✓ New sources of power
- ✓ Broadened capabilities base

- *New technology context*
- *Broadened threat context*
- *New strategic context*

A Broad and Sustained Competitive Advantage

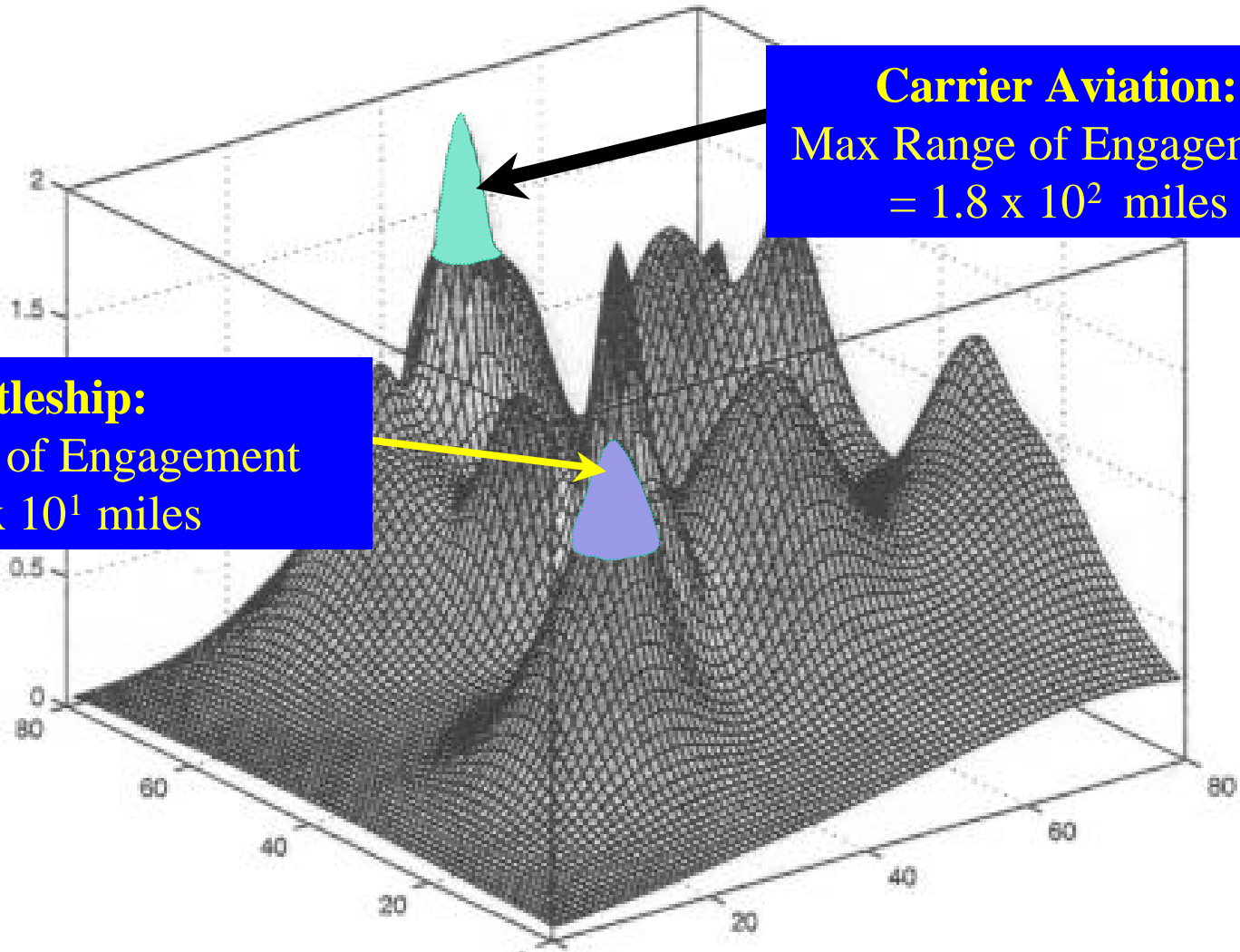
Creating Competitive Advantage

...Historical Insights

- Characteristics of *New Sources of Competitive Advantage*
 - Order of magnitude change in a *key* dimension of warfare
 - Emergence of “New Elite” – *Displacement* of “Existing Elite”
- Land Warfare: Sustained Rate of Fire
 - Rifle (1.8×10^1 rounds per minute)
 - Machine Gun (6×10^2 rounds per minute)
- Land Warfare: Sustained Speed Maneuver
 - Cavalry + Infantry
 - Mechanized Armor + Infantry + Air Power
- Warfare at Sea: Range of Engagement
 - Battleship: 1.8×10^1
 - Carrier Aviation: 1.8×10^2

Order of Magnitude Change is a leading indicator for a potential new source of ***Competitive Advantage***

Creating New Warfighting Capabilities: Warfare at Sea



Carrier Aviation:

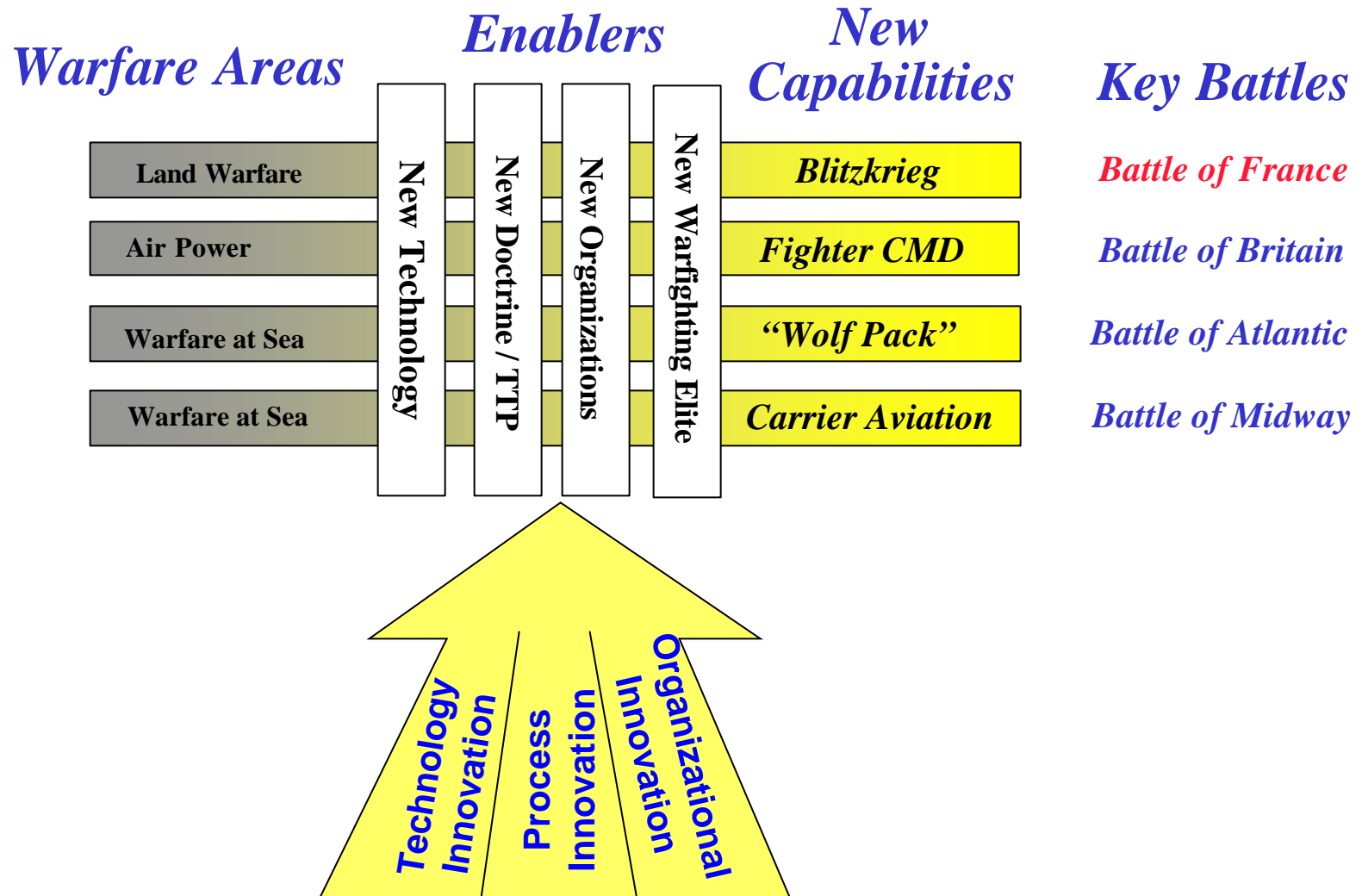
Max Range of Engagement
 $= 1.8 \times 10^2$ miles

Battleship:

Max Range of Engagement
 $= 1.8 \times 10^1$ miles

Innovation is the methodology for exploring a Fitness Landscape

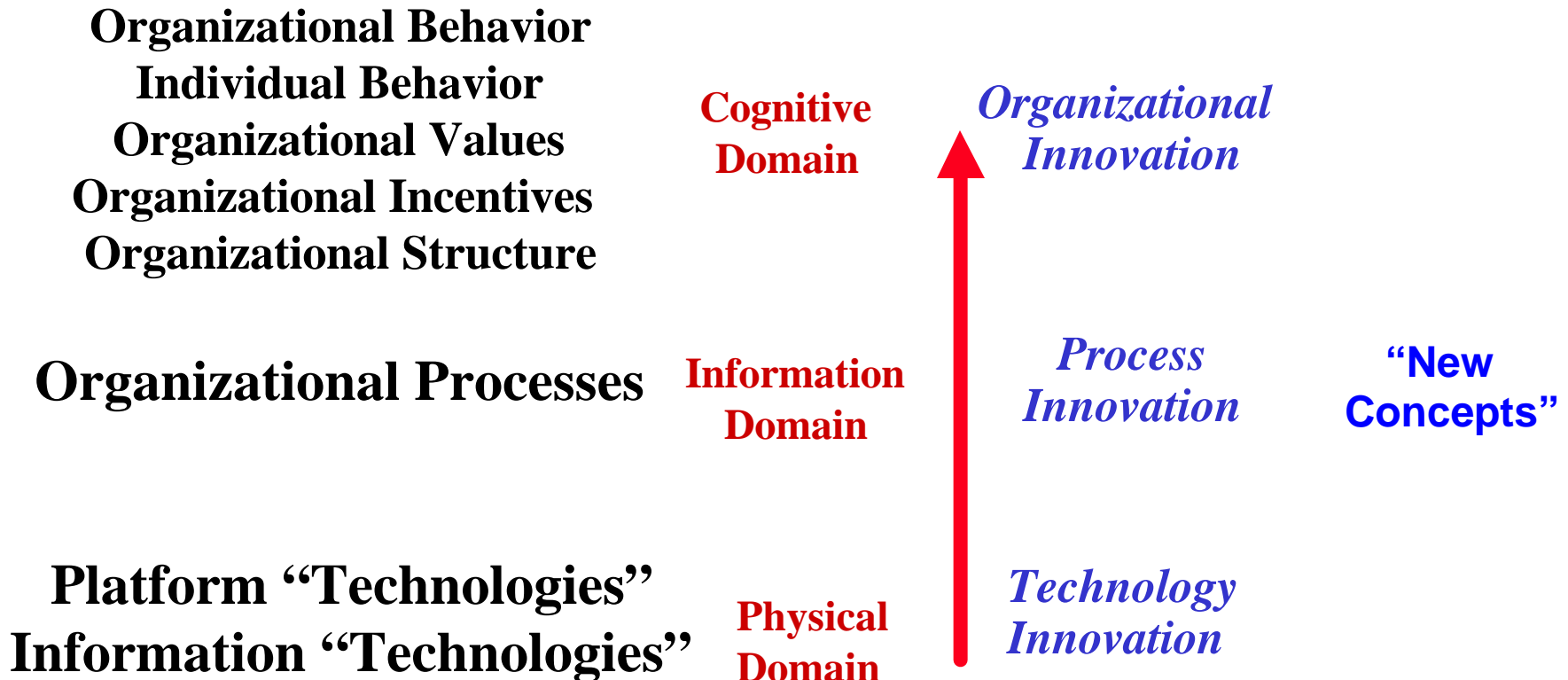
Creating Competitive Advantage: Warfighting Innovation



Warfighting Innovation → Competitive Advantage

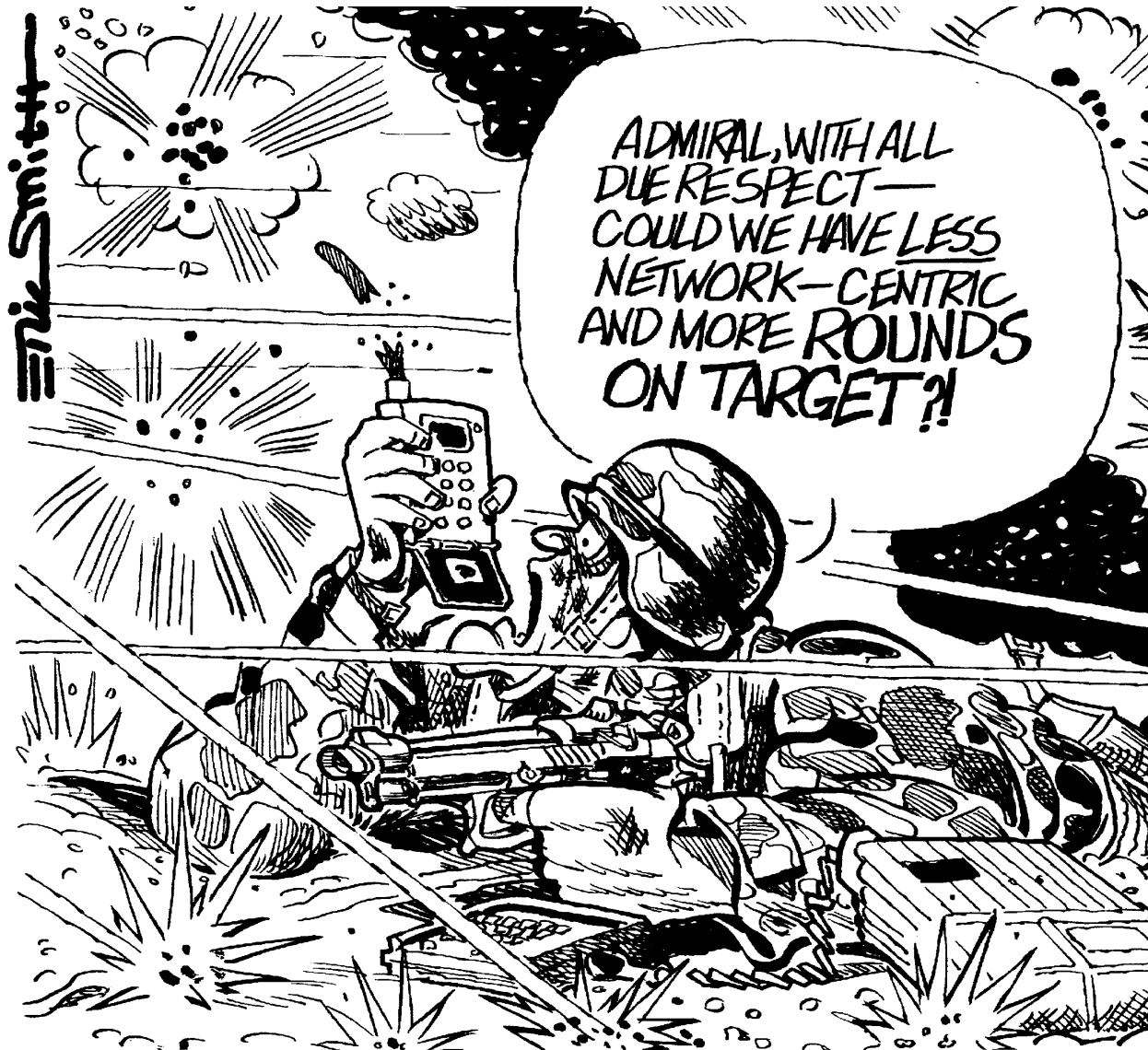
Creating Competitive Advantage: Overcoming Impediments to Innovation

Vision and Leadership are key to overcoming Impediments to Innovation

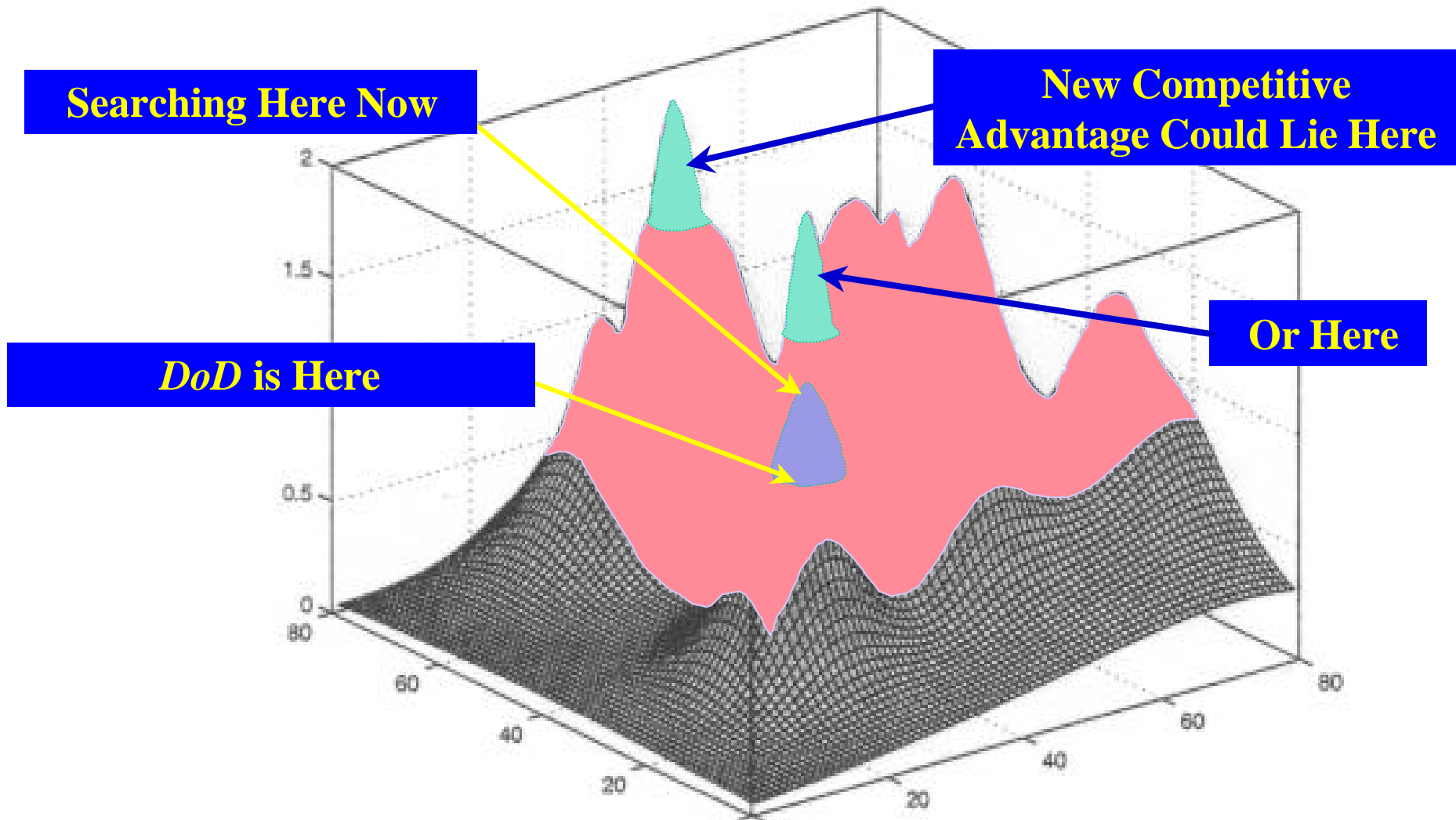


Increasing Level of Difficulty for Change

Impediments to Innovation: Push Back by the “Existing Elite”



Exploring the New Competitive Landscape



How Do We Explore the “Evolving Competitive Landscape”

Transforming Defense

...Corporate Strategy

Part I: Continuous small steps

Sustaining

Evolutionary changes

Stay on the local maximum

Part II: Many medium jumps

Explore and expand the local region

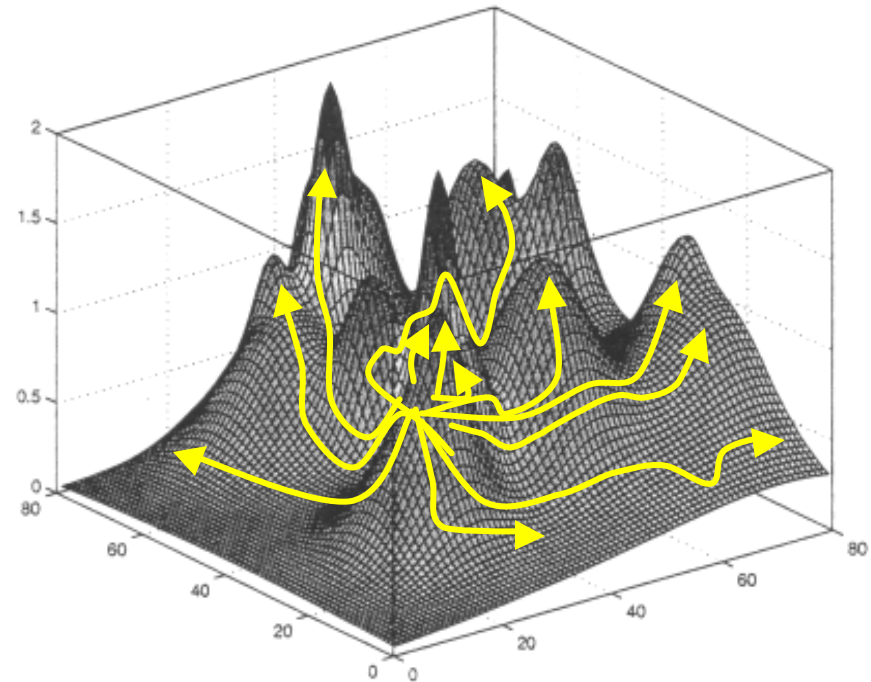
New doctrine / organization / systems

Part III: A few big bets

Could change DOD

Change the world

Create a new game with new rules



“If you are not making any big bets you are a fixed strategic target and at risk.”

Exploring the New Competitive Landscape: Tangible Progress



Transformation Strategy

- Transform from Industrial Age to the Information Age

Implement Network Centric Operations

- Ensure sustained competitive advantage

Collaborate with Allies

Dissuade competitive entry

Underwrite deterrence

Implement countervailing strategies

- Broaden the capabilities base

Operational, Technical, Industrial

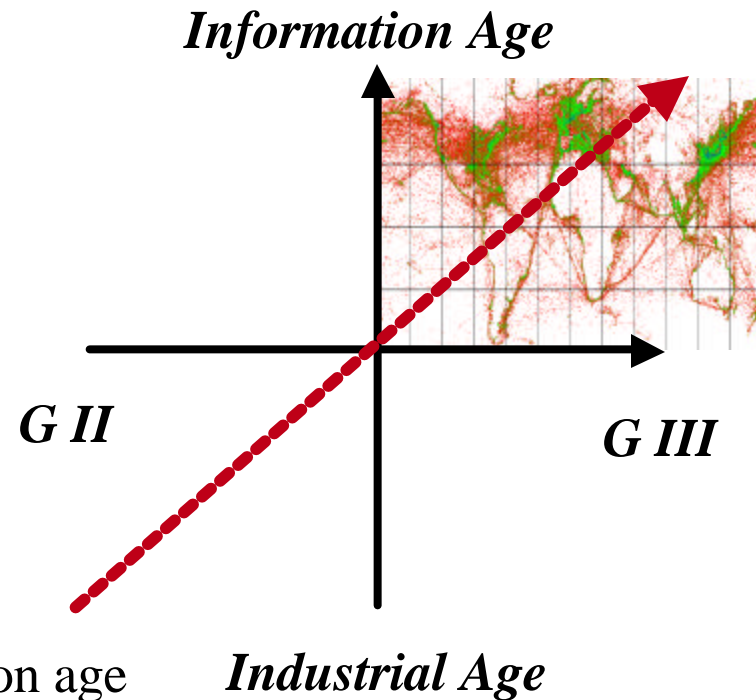
Create new competitive areas

Revalue competitive attributes for the information age

Decrease capabilities cycle time

- Leverage our advantages and opportunities

Manage the revaluation/rebalancing of capabilities and processes



Transforming Defense

... The New American Way of War

The New Rules

- Fight first for information superiority
- Speed of command
- Access to information: shared awareness
- Dispersed forces: noncontiguous operations
- Demassification
- Elimination of process lines
(e.g. - fusion of ops, intel & logistics or organize, deploy, employ & sustain)
- Elimination of structural lines
(e.g. - Joint ops at the small unit level)
- Self-synchronization
- Alter initial conditions at higher rates of change
- Compression of levels of war

Network-Centric Warfare

High Rates of Change
Closely Coupled Events
Lock In / Out
Speed of Command
Self Synchronization

What's Valued

Networking
Sensing
Envelope Management
Speed / Endurance
Numbers
Risk Tolerance
Staying Power

Transforming Defense: Exploiting New Sources of Power

*“What we are seeing, in moving from the **Industrial Age** to the **Information Age**, is what amounts to a new **theory of war**: power comes from a different place, it is used in different ways, it achieves different effects than it did before. During the **Industrial Age**, power came from mass. **Now power tends to come from information, access, and speed.** We have come to call that new theory of war **network-centric warfare**. It is not only about networks, but also about how wars are fought-how power is developed.”*

VADM Arthur K. Cebrowski, USN (Ret)

Director, Force Transformation

IEEE Spectrum – July 2002

Information Age Transformation

...what we saw in Operation Iraqi Freedom

- **NCW Implementation**
- **The power of shared awareness**
 - Intelligence, Surveillance, Recon*
 - High speed networking*
 - New capabilities / Tactics, Techniques, Procedures*
- **Networking + ISR =**
 - Speed*
- **Information running ahead of the physics**
- **A new Airpower – Land power intersection**
 - All weather weapons*
 - Close Air Support*
 - Interdiction*
 - Speed*
 - Weight of Fire vs Precision*
 - The non-contiguous battlespace*
- **Movement toward tactical level jointness / interoperability**
 - Especially Special Operations Forces*

Speed creates the appearance of an incompetent opponent
ISR + Speed of Decision + Lethality => Bad options for the enemy
A New “Sweet Spot”

Information Age Transformation: Network Centric Warfare

Translates an **Information Advantage** into a decisive **Warfighting Advantage**

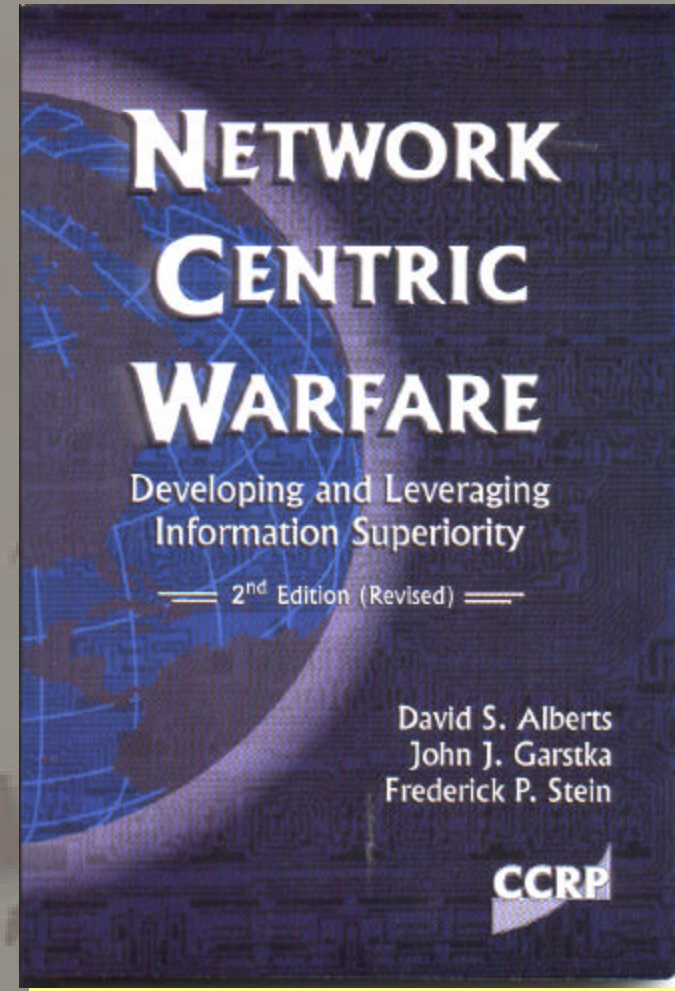
Information Advantage - enabled by the robust networking of **well informed** geographically dispersed forces

Characterized by:

- Information sharing
- Shared situational awareness
- Knowledge of commander's intent

Warfighting Advantage - exploits behavioral change and new doctrine to enable:

- Self-synchronization
- Speed of command
- Increased combat power



Exploits Order of Magnitude Improvement in Information Sharing

Warfighting Advantage

Networked Forces

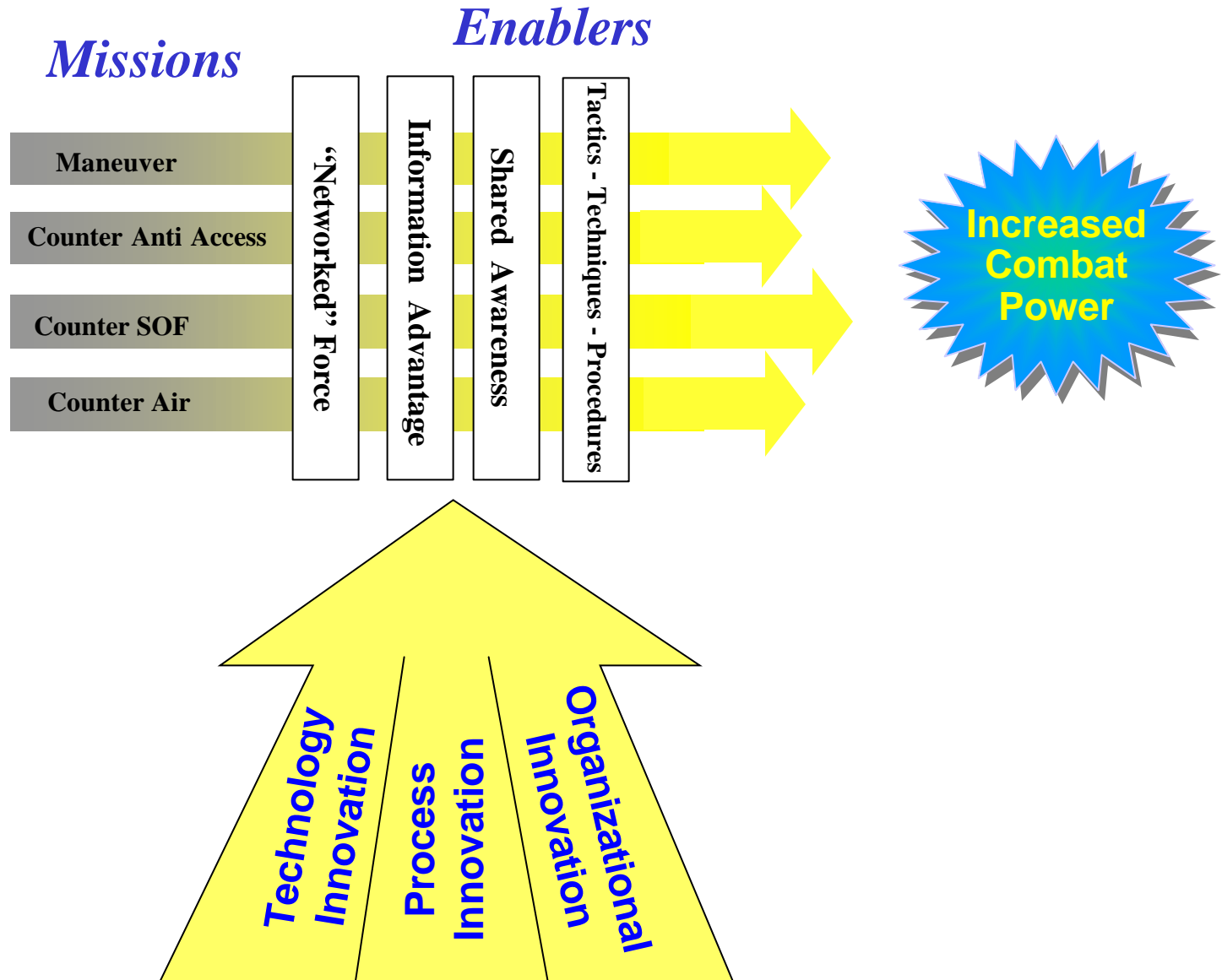
Outfight

Non-Networked Forces

Warfighting Advantage: More Evidence

- **Full Dimensional Protection - Counter Air**
 - USAF found F-15Cs, working with data links (shared awareness), **increased kill ratio by over 100% -- 2.6:1** for both Day & Night Ops (JTIDS Operational Special Project - Mid 1990's)
- **Dominant Maneuver**
 - Digitized forces demonstrate capability to fight over a much larger area with **fewer forces** than non-digitized forces (USA Division Capstone Exercise - Phase I, Apr 2001)
- **Precision Engagement - Counter Anti Access**
 - Networked combined force requires **62% less time** to restore mine free shipping in Strait of Hormuz (FBE Foxtrot, Dec 1999)
- **Precision Engagement - Counter SOF (CSOF)**
 - Decision cycle reduced by half - shooter effectiveness increased
 - **10 fold reduction** in SOF penetrators by water (FBE Delta, Oct 1998)

Understanding the Evidence for Warfighting Advantage

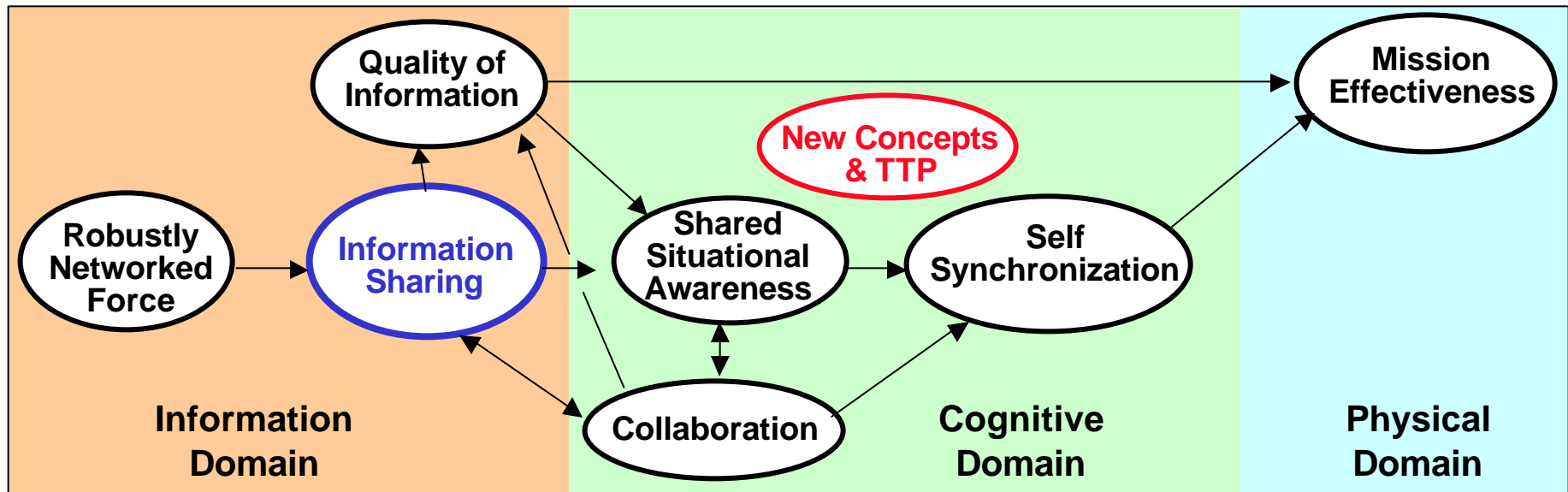


Exploiting Order of Magnitude Change

Tenets of NCW: A Hypothesis Regarding Sources of Power

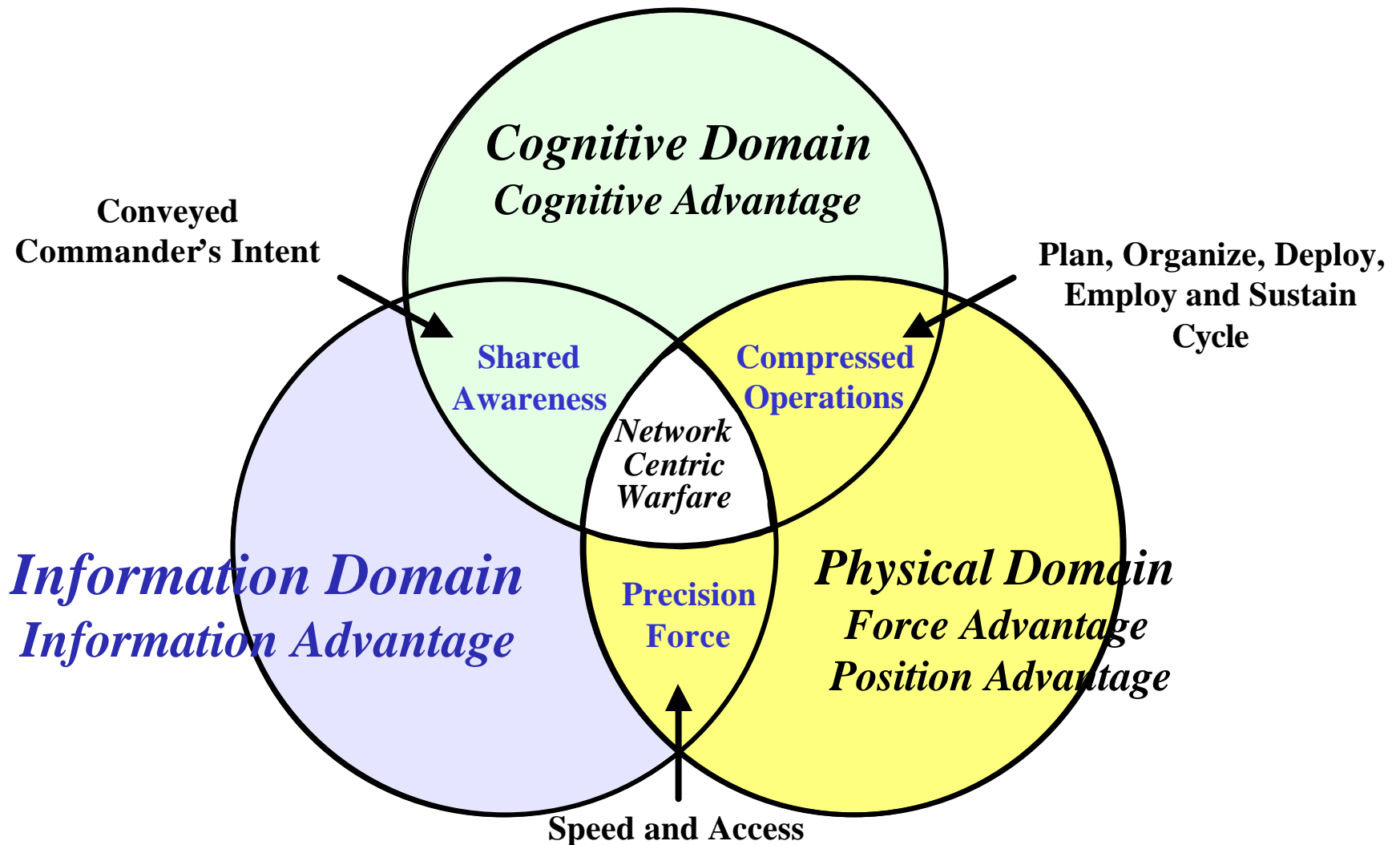
- A robustly networked force improves information sharing
- Information sharing and collaboration enhances the quality of information and shared situational awareness
- Shared situational awareness enables collaboration and self synchronization, and enhances sustainability and speed of command
- These in turn dramatically increase mission effectiveness

Top Level Measures for Exploring NCW Hypothesis

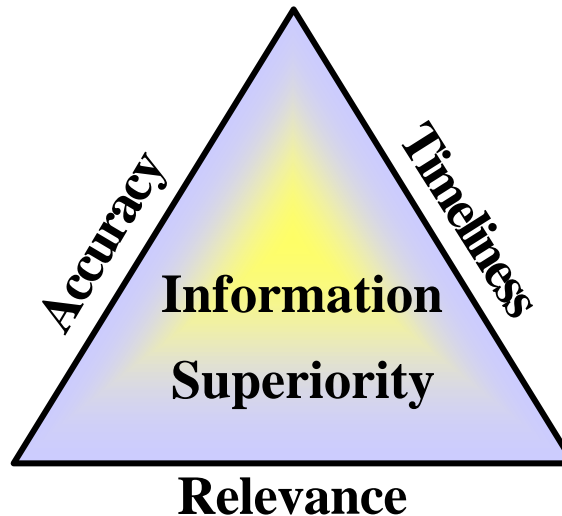


Information-Age Warfare

... Domains of conflict



Information Advantage / Superiority



...relative to an adversary...

OURS



NEEDS

THEIRS



NEEDS



ABILITY TO SATISFY



ABILITY TO SATISFY

Creating Information Advantage: Meeting Warfighter's Information Needs



Individual/ Node

Unit/ Flight

Force/ Operational

Info On:

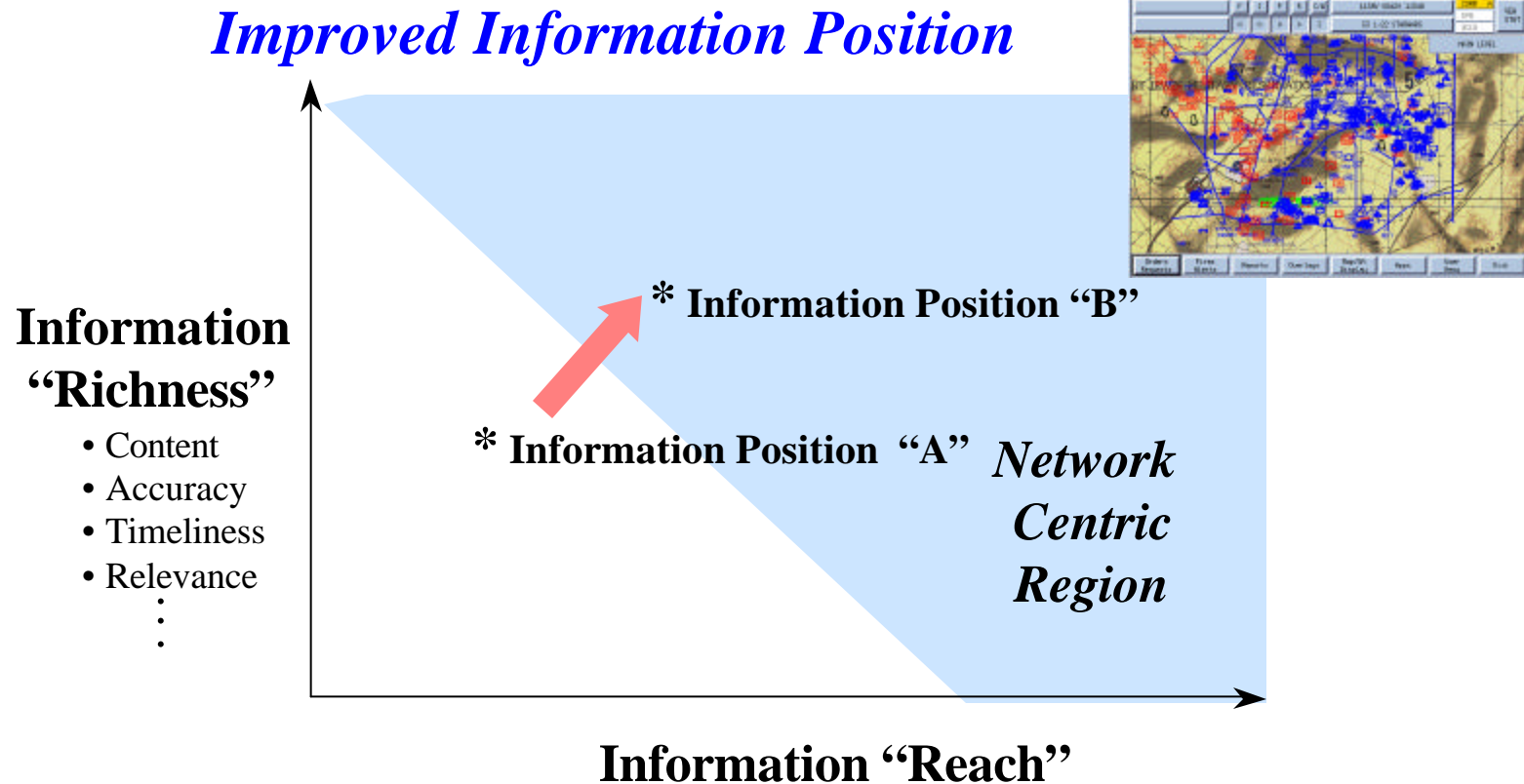
**Blue
Force**

**Neutrals /
Non
Combatants**

**Red
Force**

<p>Where am I? Where are my buddies? What is CDR's Intent?</p>	<p>Where is the Flight? What is its Disposition? What is CDR's Intent?</p>	<p>Where is the Force? What is its Disposition? Does CDR's intent need to change?</p>
<p>Where are the Airlines?</p>	<p>Where are the Airlines?</p>	<p>Is there commercial Air traffic in the area?</p>
<p>Where is the Adversary?</p>	<p>Where is the Adversary?</p>	<p>How is the Adversary Reacting? Is this what was expected?</p>

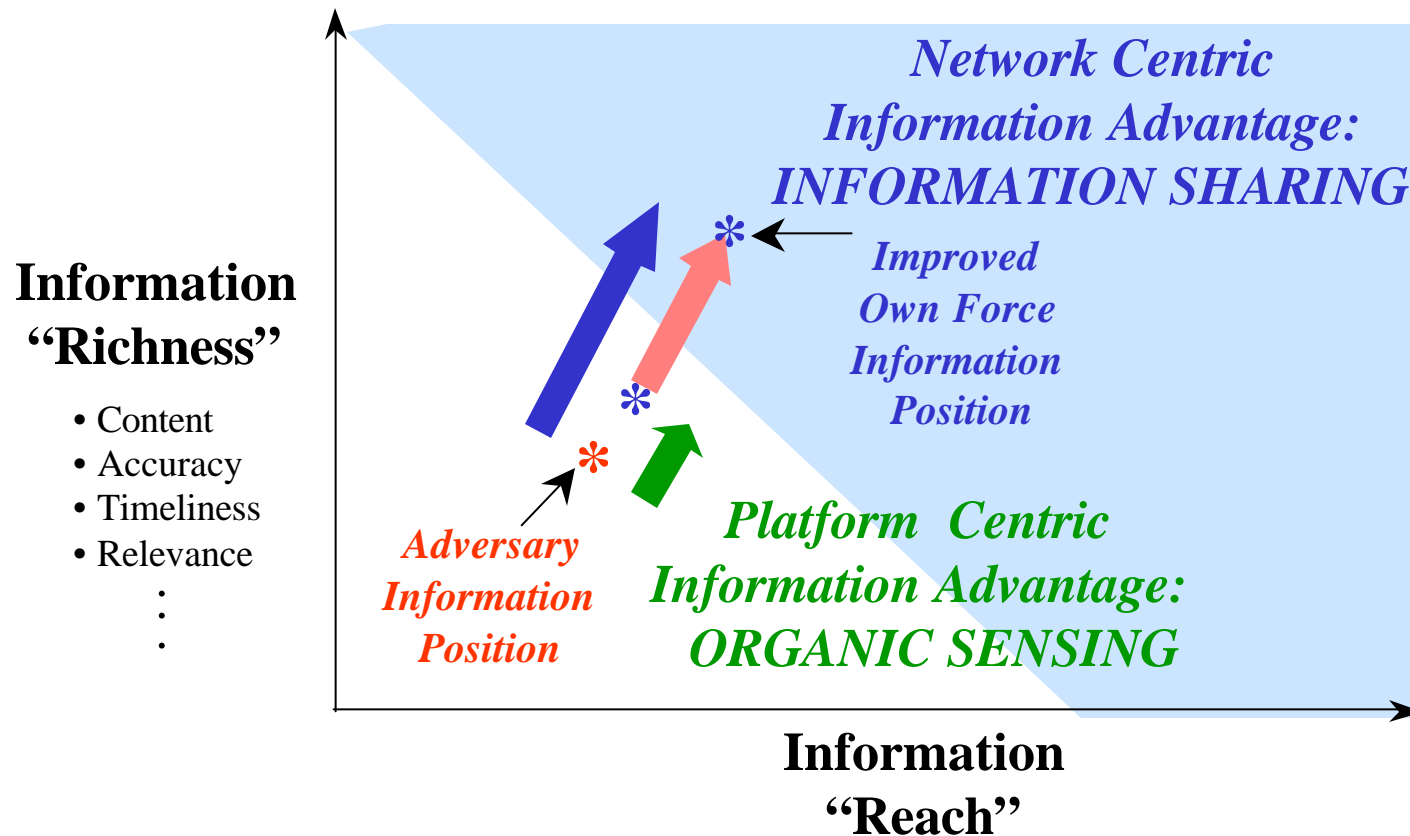
Creating Information Advantage: Meeting Warfighter's Information Needs



Networking the Force:

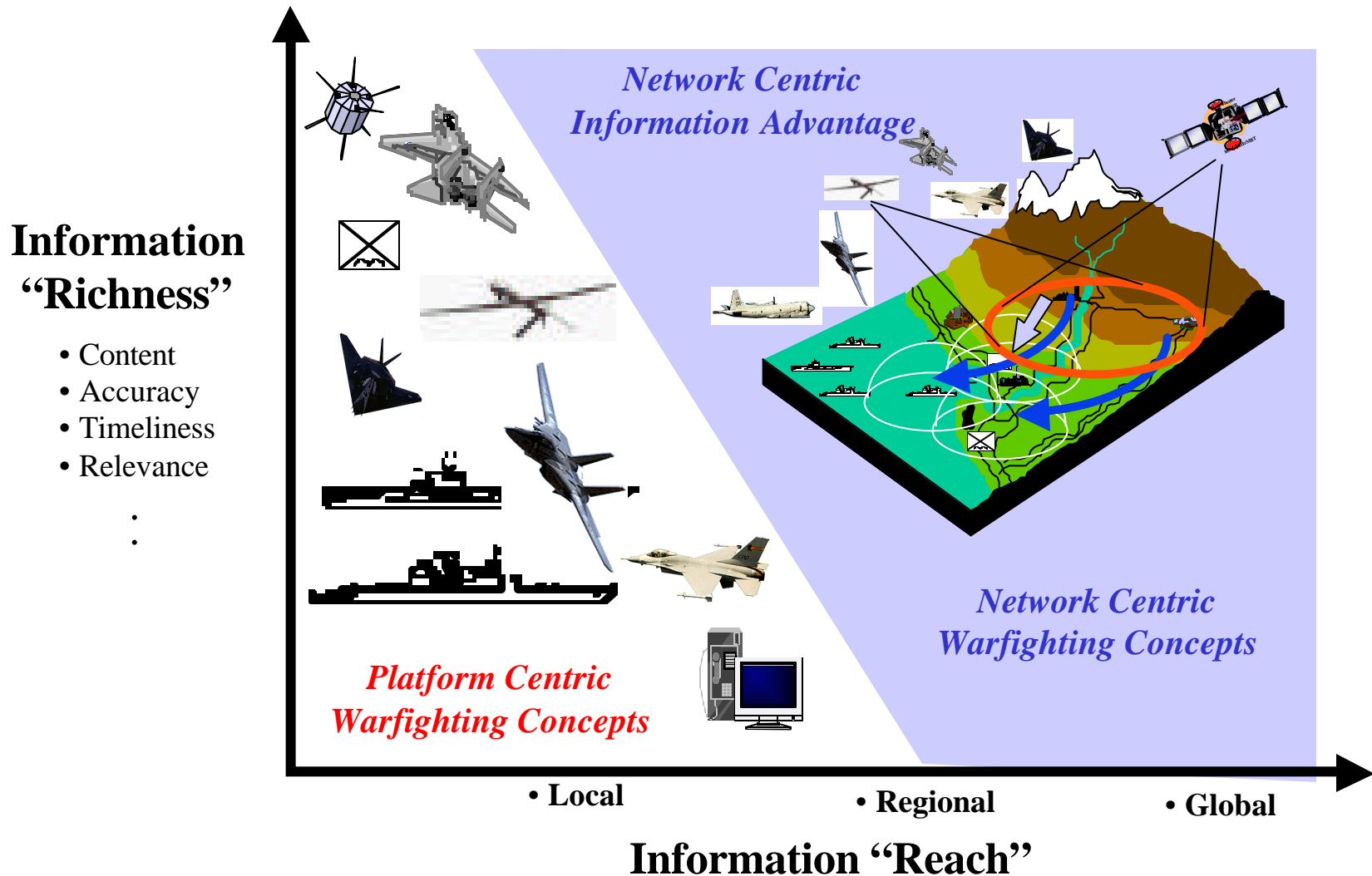
- *Provides Warfighters with Access to a New Region of the Information Domain*
- *Order of Magnitude Change enables New Type of Information Advantage*

Creating Information Advantage: Exploiting Information Sharing as a Source of Power



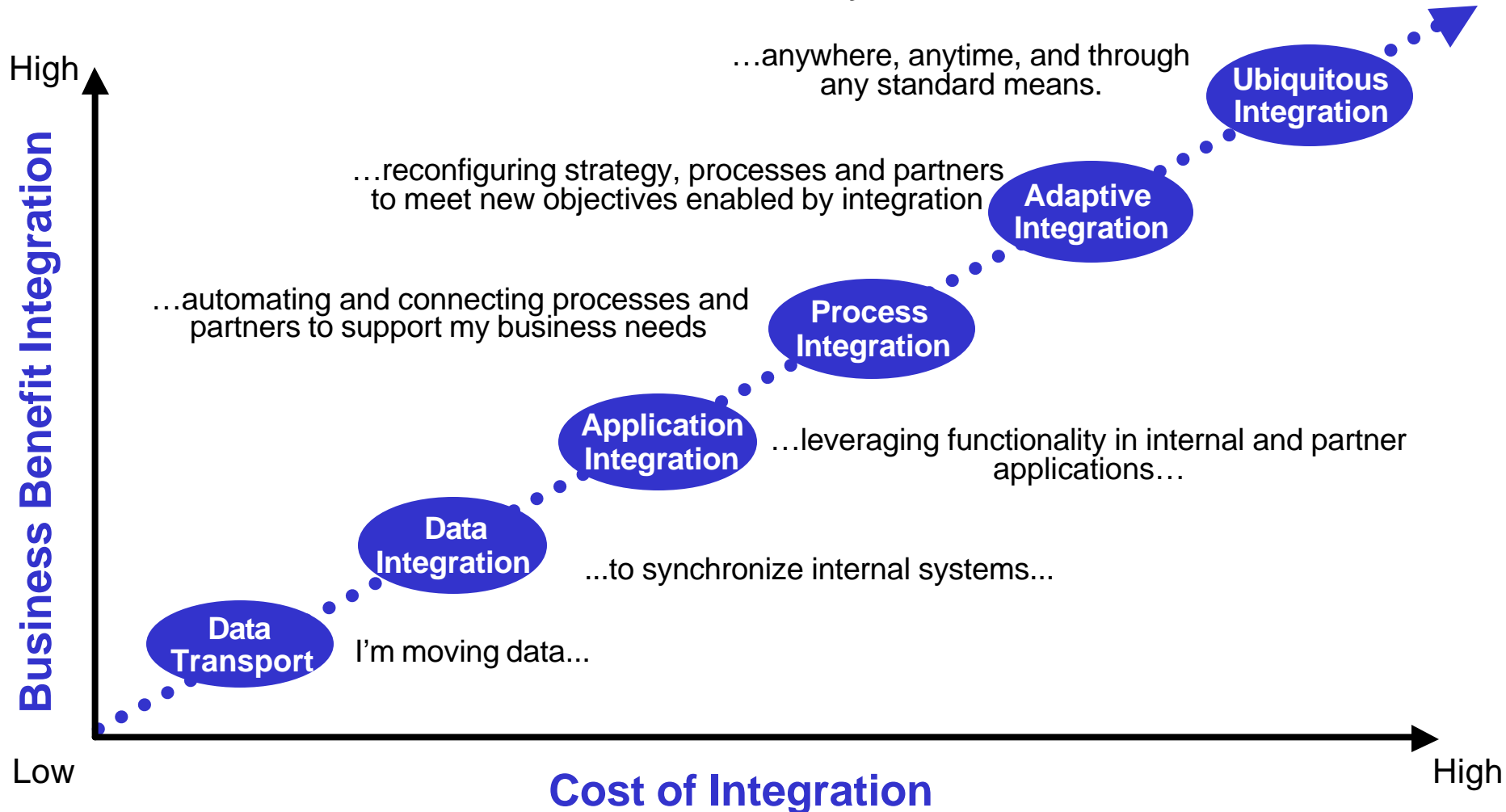
*Information Sharing is a key
enabler of increased Combat Power*

Exploiting Information Advantage: Developing Network Centric Warfighting Concepts



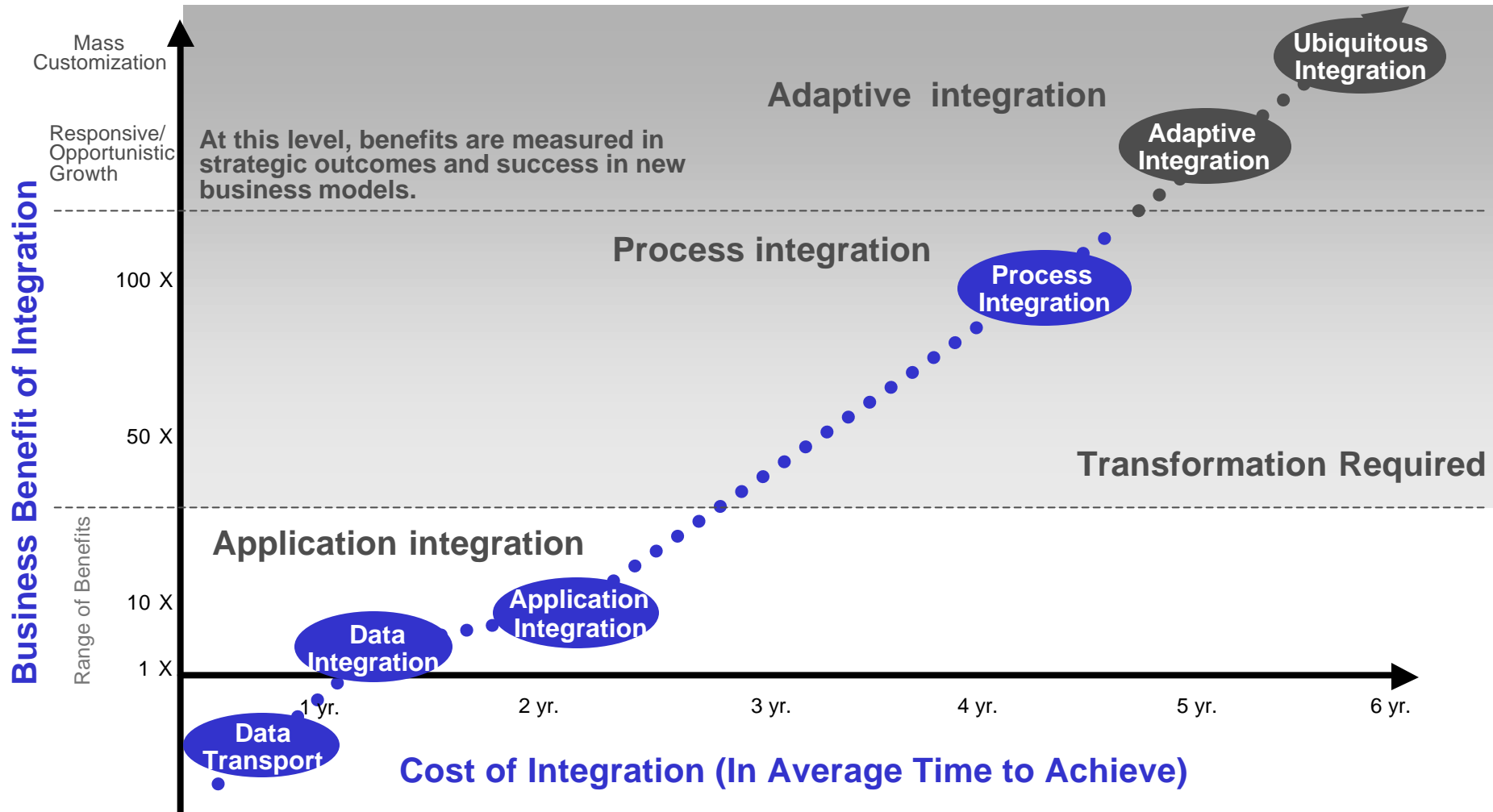
Creating Information Advantage: Insights from the Commercial Sector

Initial Theory



Source: Accenture

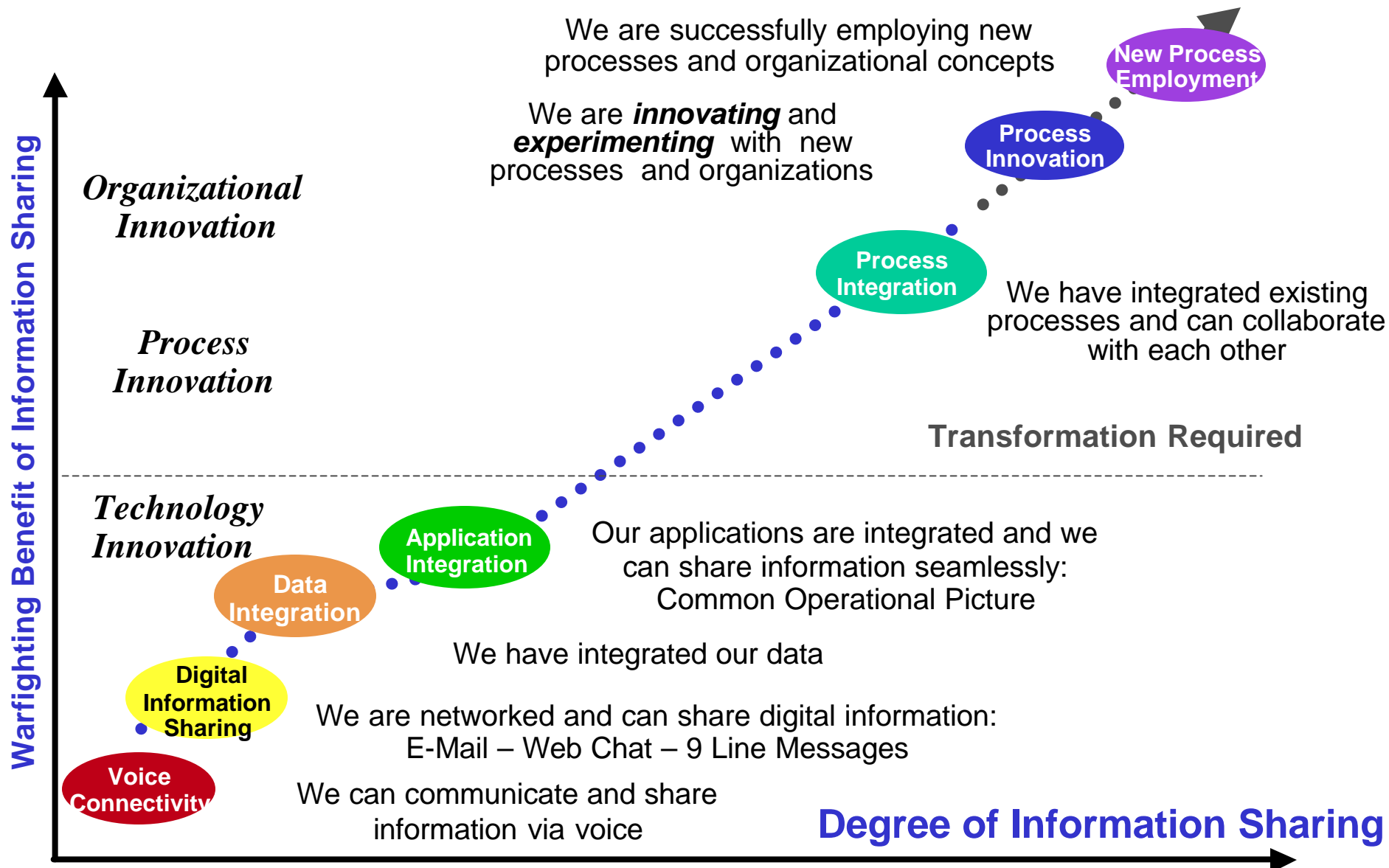
Theory Meets Business Reality: Discontinuity in Integration Continuum



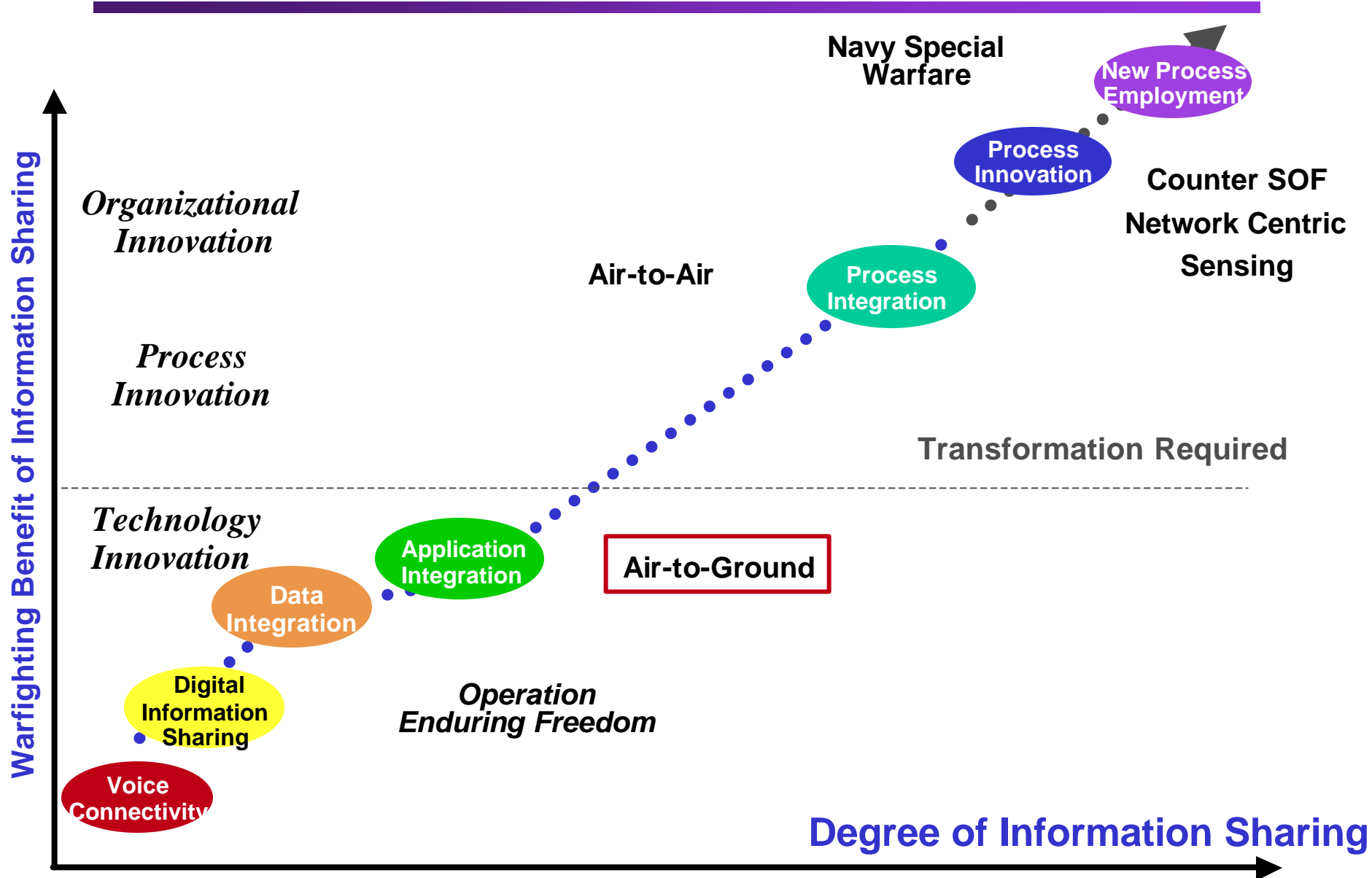
* Findings represent study and analysis of the results achieved by 17 large organizations. Given the size of the firms studied, the multiple for identifying benefits (X) equated to roughly \$1 million.

Source: OFT/Accenture/CRITO Case Study

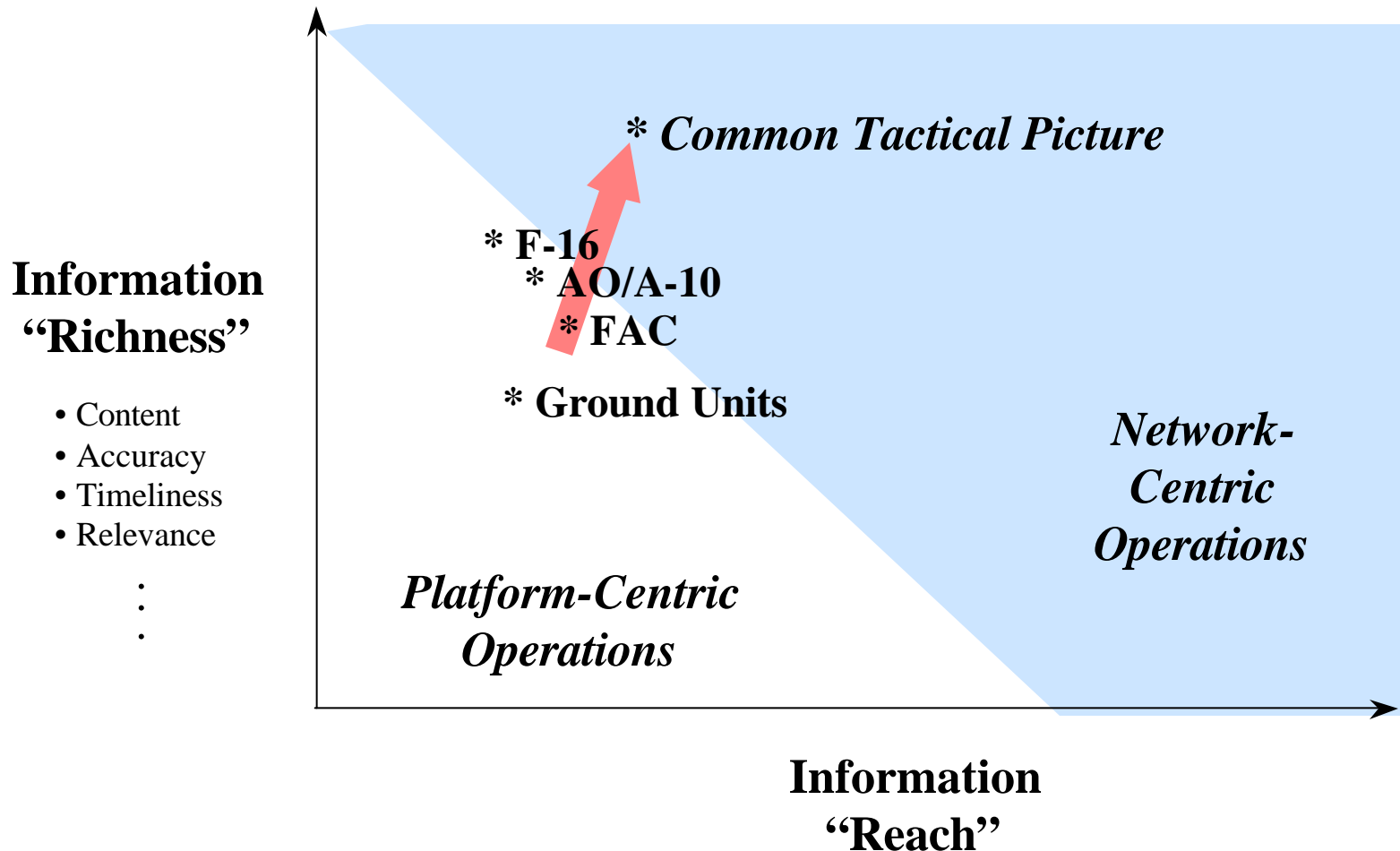
Meeting Warfighter Information Needs: Levels of Network-Centricity



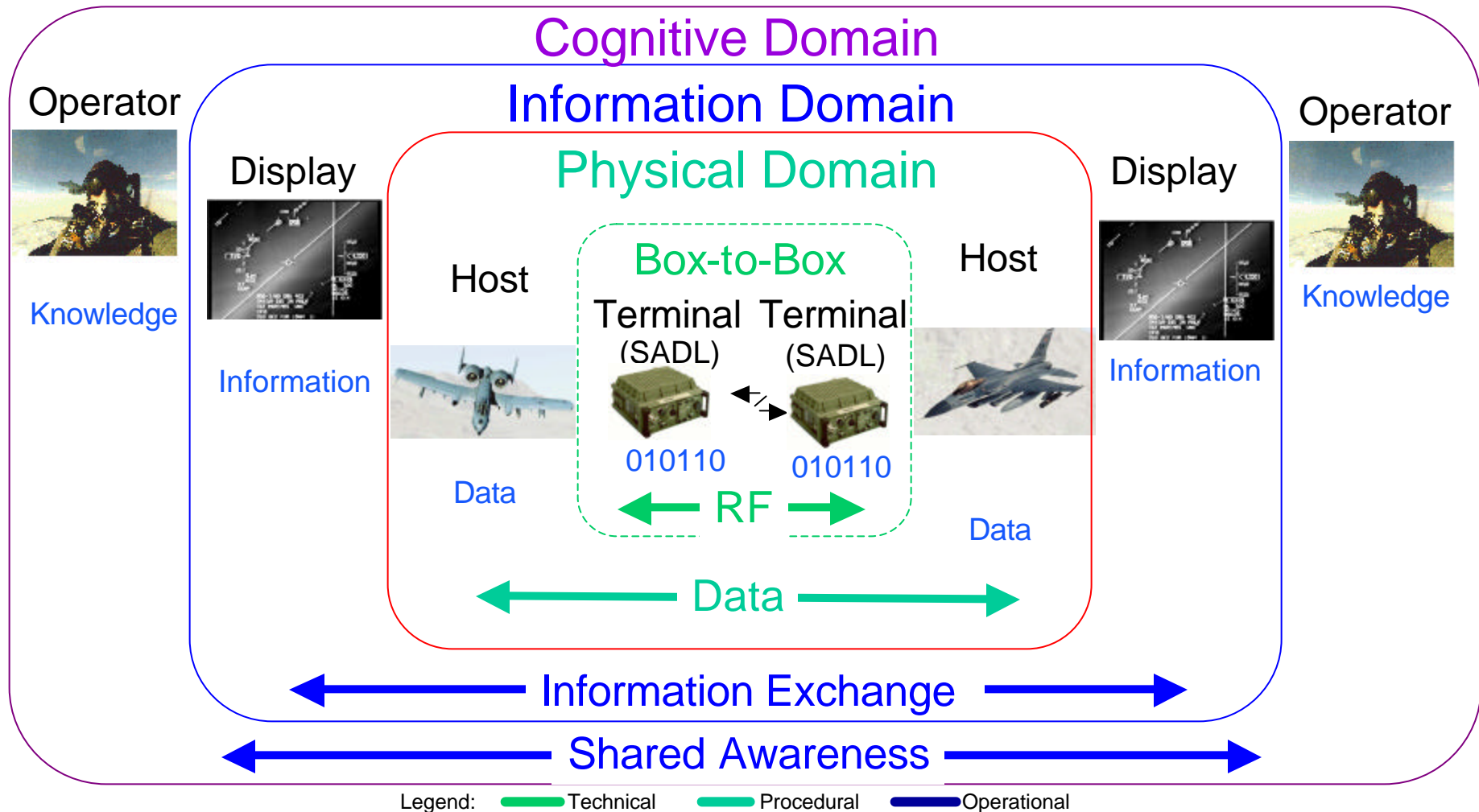
Applying Theory to Make Sense of The Warfighter's Reality



Air-to-Ground Mission: Digital Close Air Support



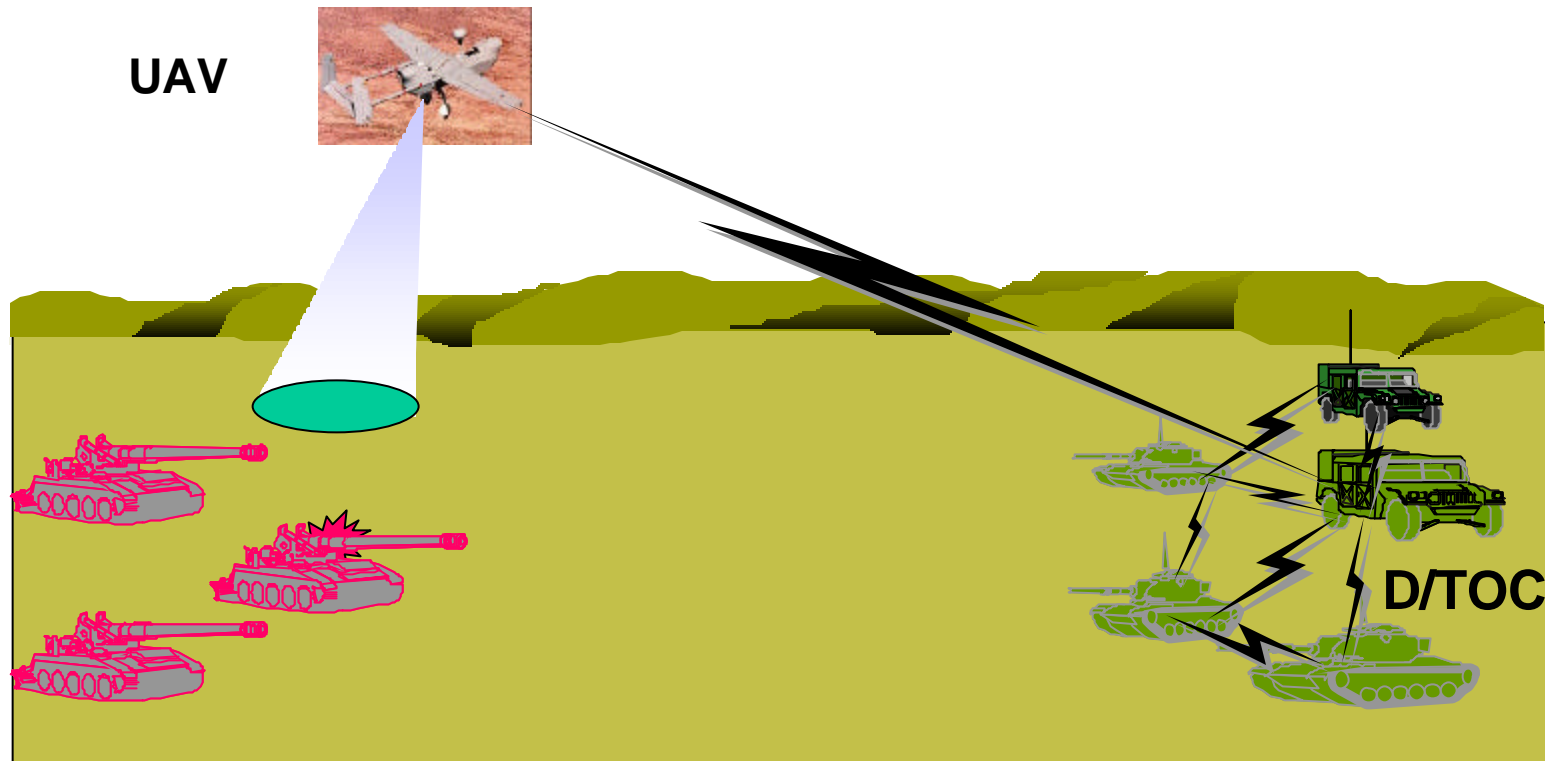
Close Air Support Mission: Domain Overlay



Digital Close Air Support: Fighting First for Information Advantage

- **Tactical Situation:**

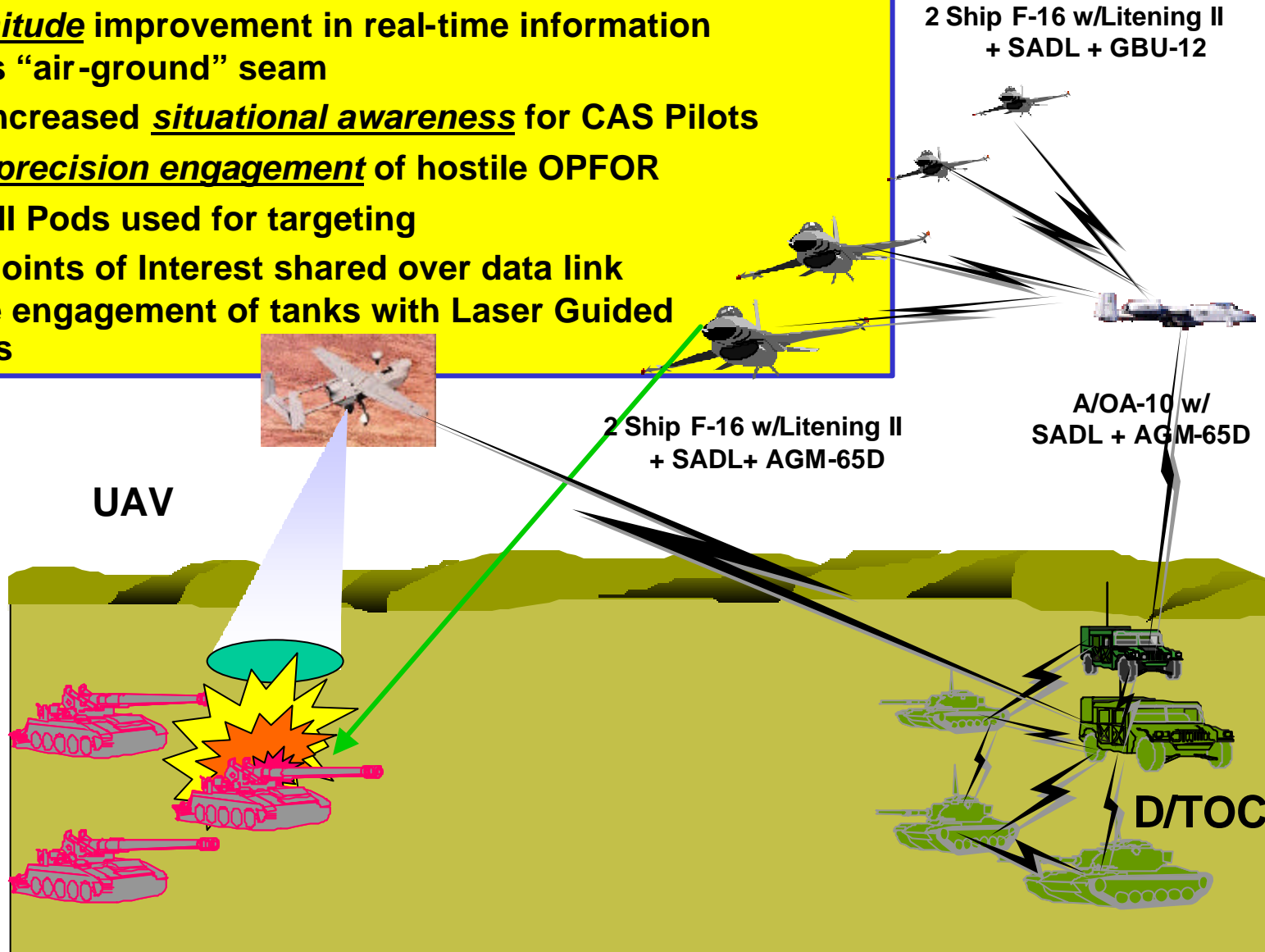
- Blue Force in defensive posture
- OPFOR moving to contact under cover of darkness
- Armored column detected by JSTARS and UAV at approximately 10 mile range from Blue Force and positively identified as hostile OPFOR
- Blue Force tracking information confirms that no Blue Force ground forces are in close proximity to OPFOR
- Fire mission assigned to Close Air Support (CAS)



Source: US Army
Division Capstone
Exercise - Phase I
(March-April 2001)

Digital Close Air Support: Network Enabled Engagement

- Order of magnitude improvement in real-time information sharing across “air-ground” seam
- Dramatically increased situational awareness for CAS Pilots
- Collaborative precision engagement of hostile OPFOR
 - Litening II Pods used for targeting
 - Sensor Points of Interest shared over data link
 - Selective engagement of tanks with Laser Guided Munitions

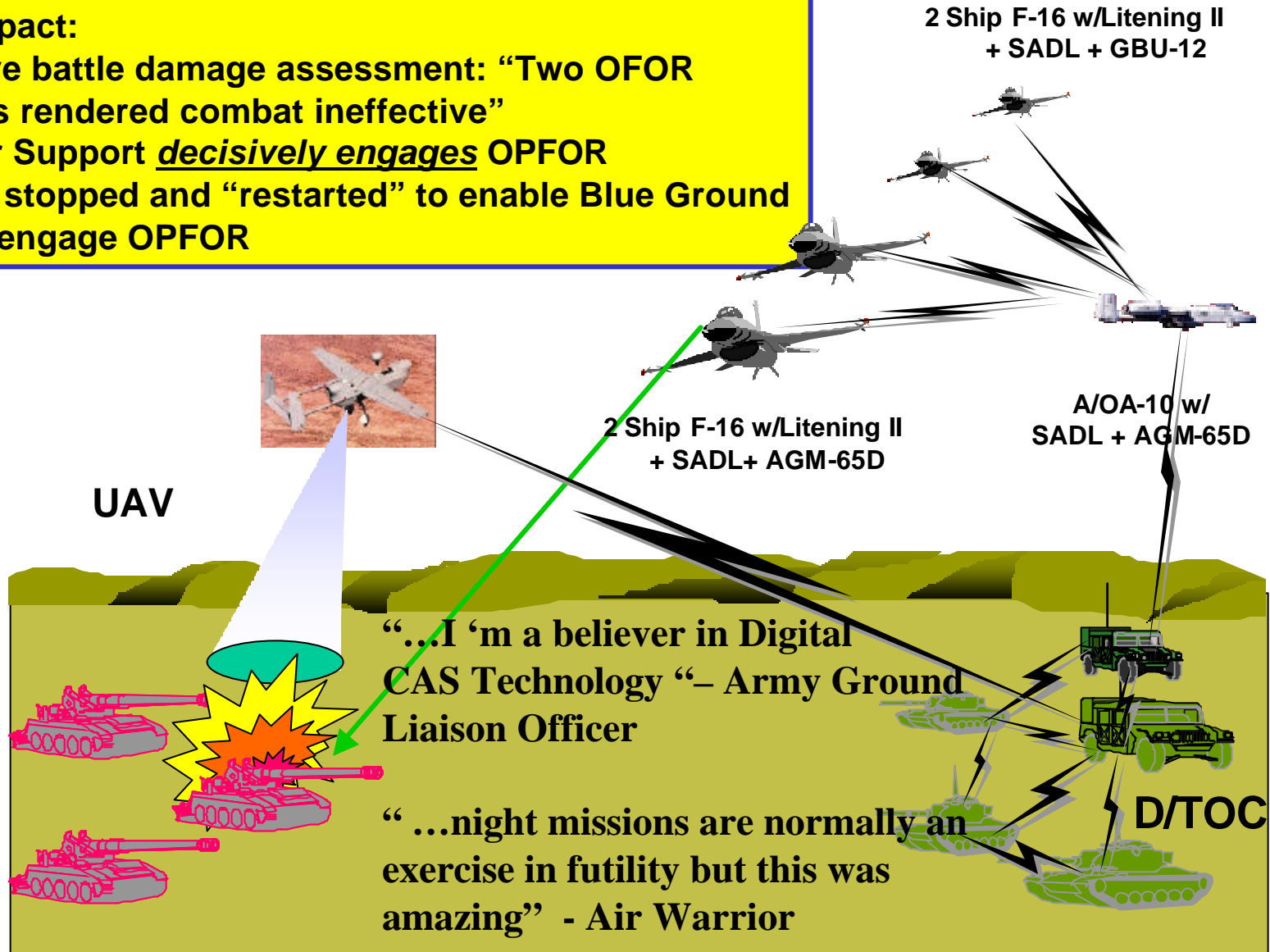


Source: US Army
Division Capstone
Exercise - Phase I
(March-April 2001)

Digital Close Air Support: Decisive Defeat of OPFOR

- **Warfighting Impact:**

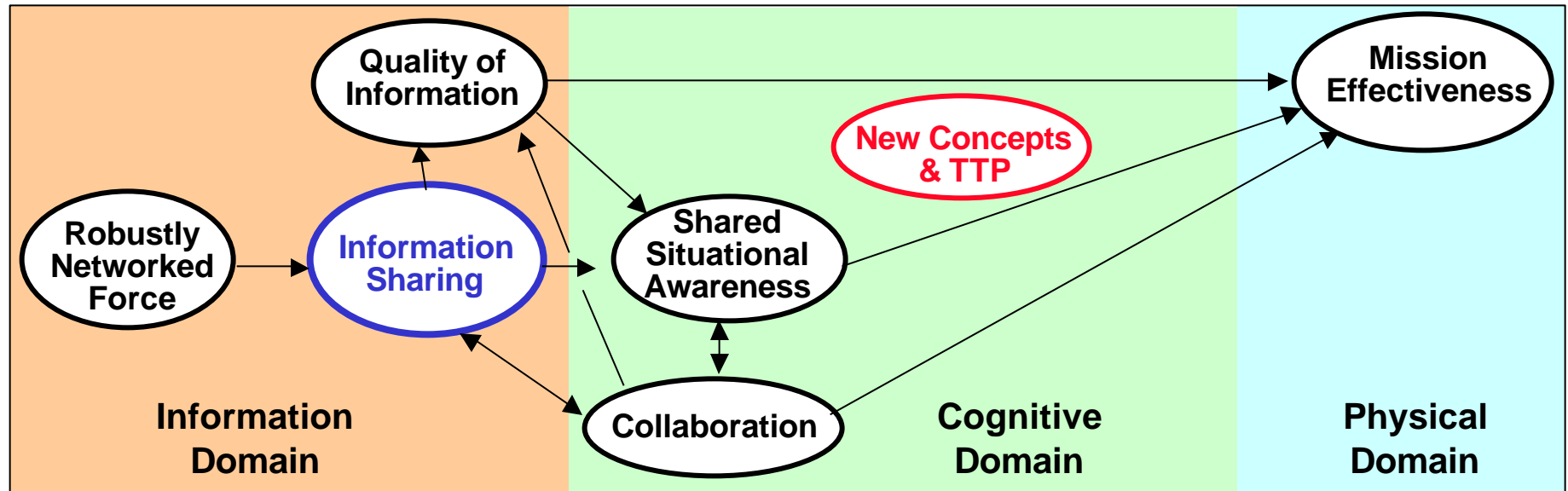
- First wave battle damage assessment: “Two OFOR Battalions rendered combat ineffective”
- Close Air Support decisively engages OPFOR
- Exercise stopped and “restarted” to enable Blue Ground Force to engage OPFOR



Exploiting Order of Magnitude Change

Quality of Information
- Precision Navigation
- Litening II Pod

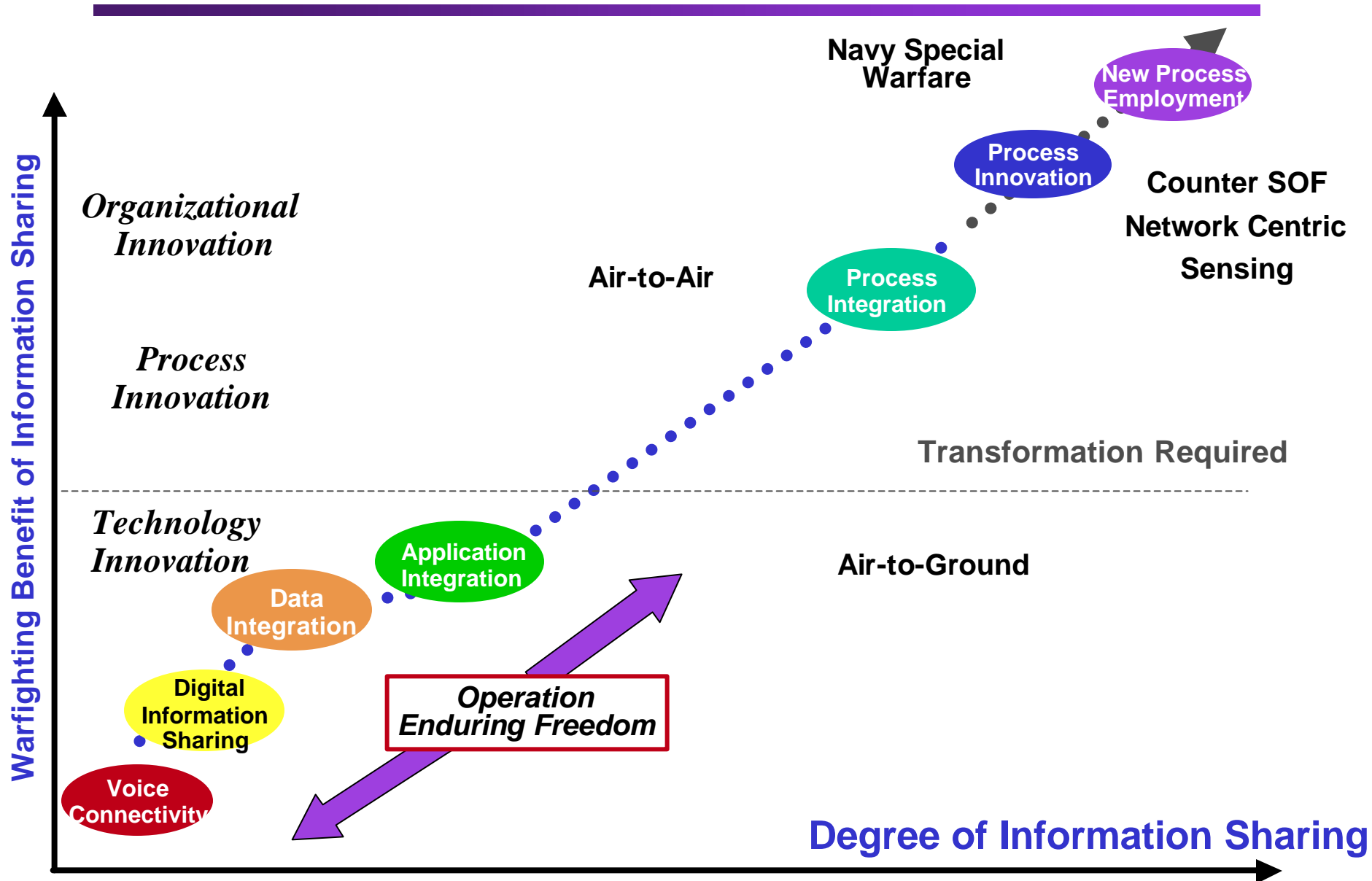
Output Measure:
Decisive Defeat
Of OPFOR



Networked Force
- Air
- Ground

Information Sharing
- Blue Force Information: “Trace” of Blue Forces
- Red Force Information: “Sensor Points of Interest”

Combat Power as a Function of Network-Centricity



Operation Enduring Freedom

“When observing Afghanistan, we are looking for the reinforcement of trend lines. Warfare is increasingly being dominated by sensors, more so than any other piece of equipment. In Afghanistan, Special Operating Forces are lightly armed, but very well connected to networks. They know where they are in relation to other Special Operating Force and they also know where the enemy is. Our fighting forces are themselves sensors and they are connected to weapons systems and platforms that are capable of delivering enormous fire power.”

VADM Arthur K. Cebrowski, USN (Ret)

Director, Force Transformation

IEEE Spectrum – July 2002

Operation Enduring Freedom: Information Sharing - Voice

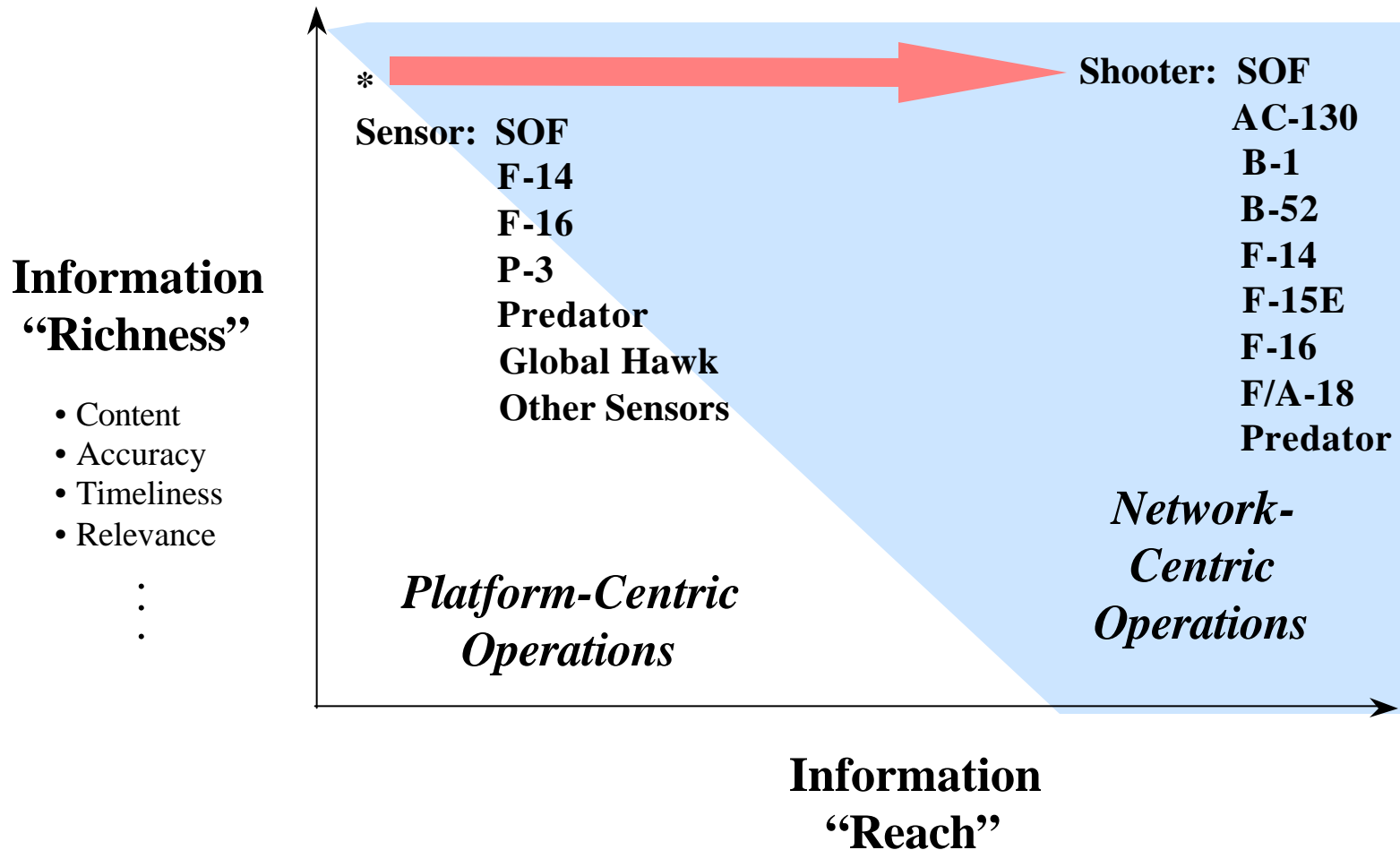
Unprecedented Tactical Agility

- SOF forces request Close-Air-Support
- F-14 providing Close-Air-Support out of weapons
- *Real Time Innovation*: F-14 Radar Intercept Officer employs onboard sensors to mensurate target
- F-14 crew passes target data - *via voice* - to AWACS and B-52 enabling successful target kill with precision munitions

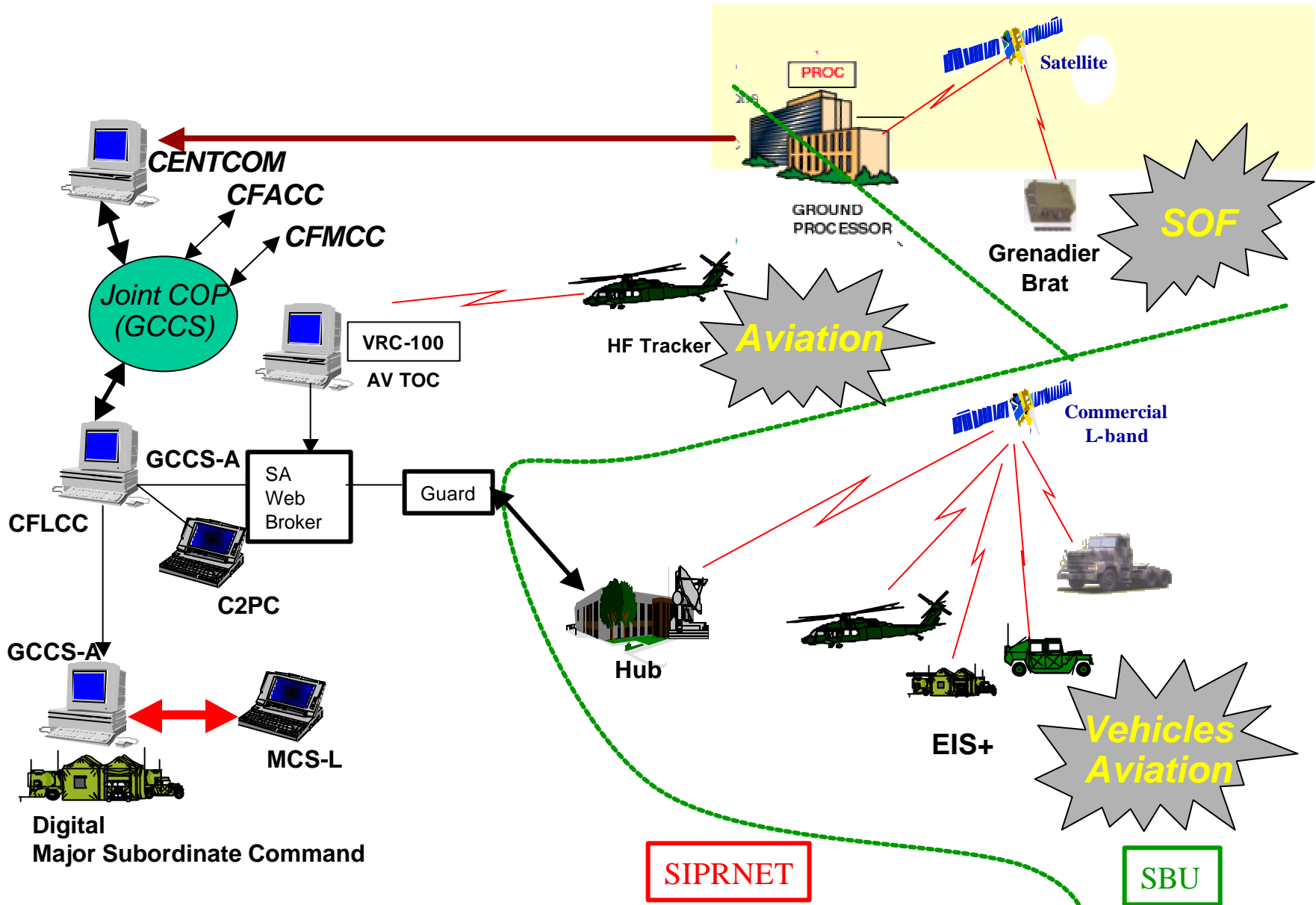


Operation Enduring Freedom: Information Sharing: Voice + Data

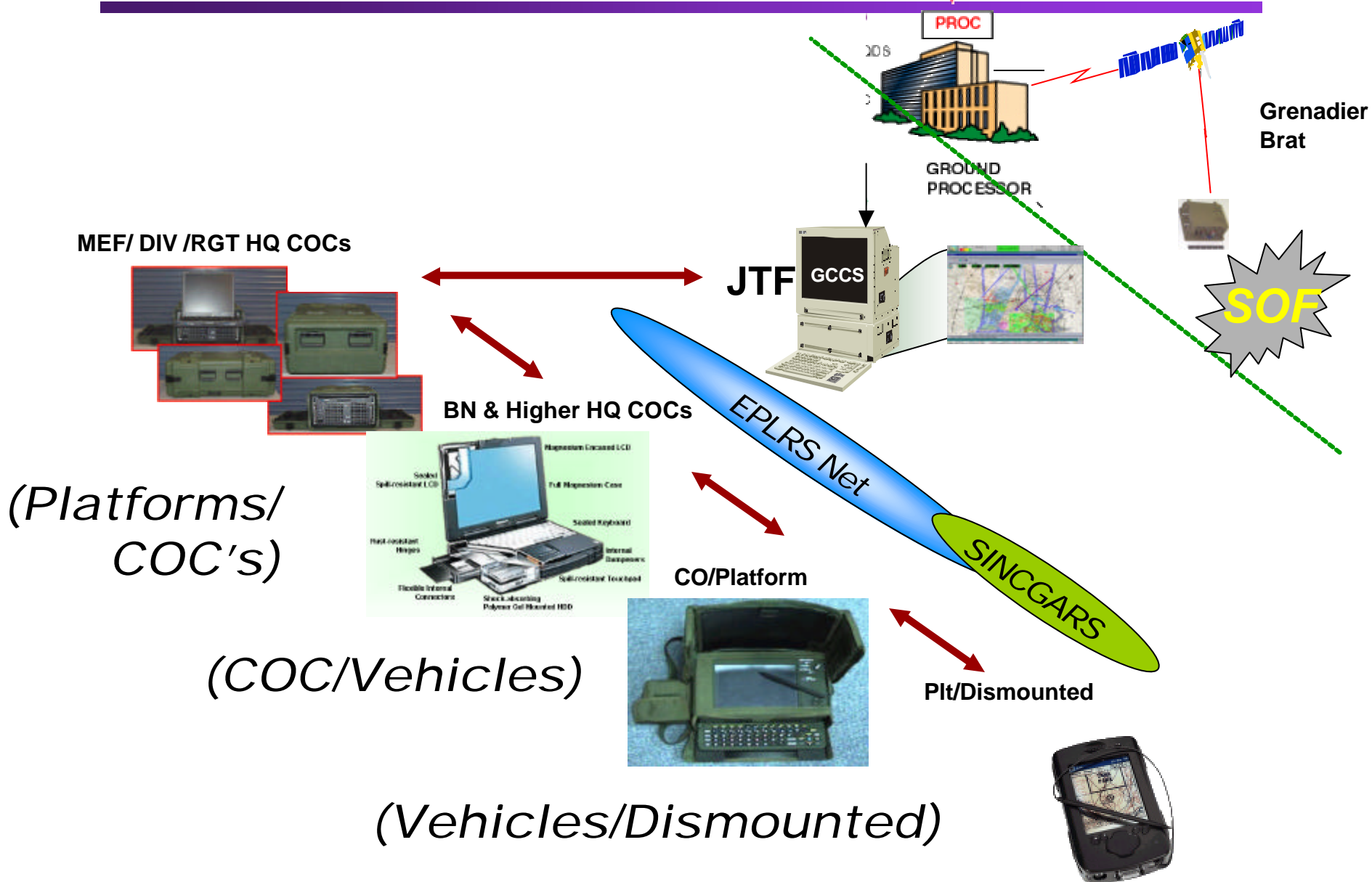
Unprecedented Tactical Agility



Operation Enduring Freedom: Information Sharing - Data (Army)

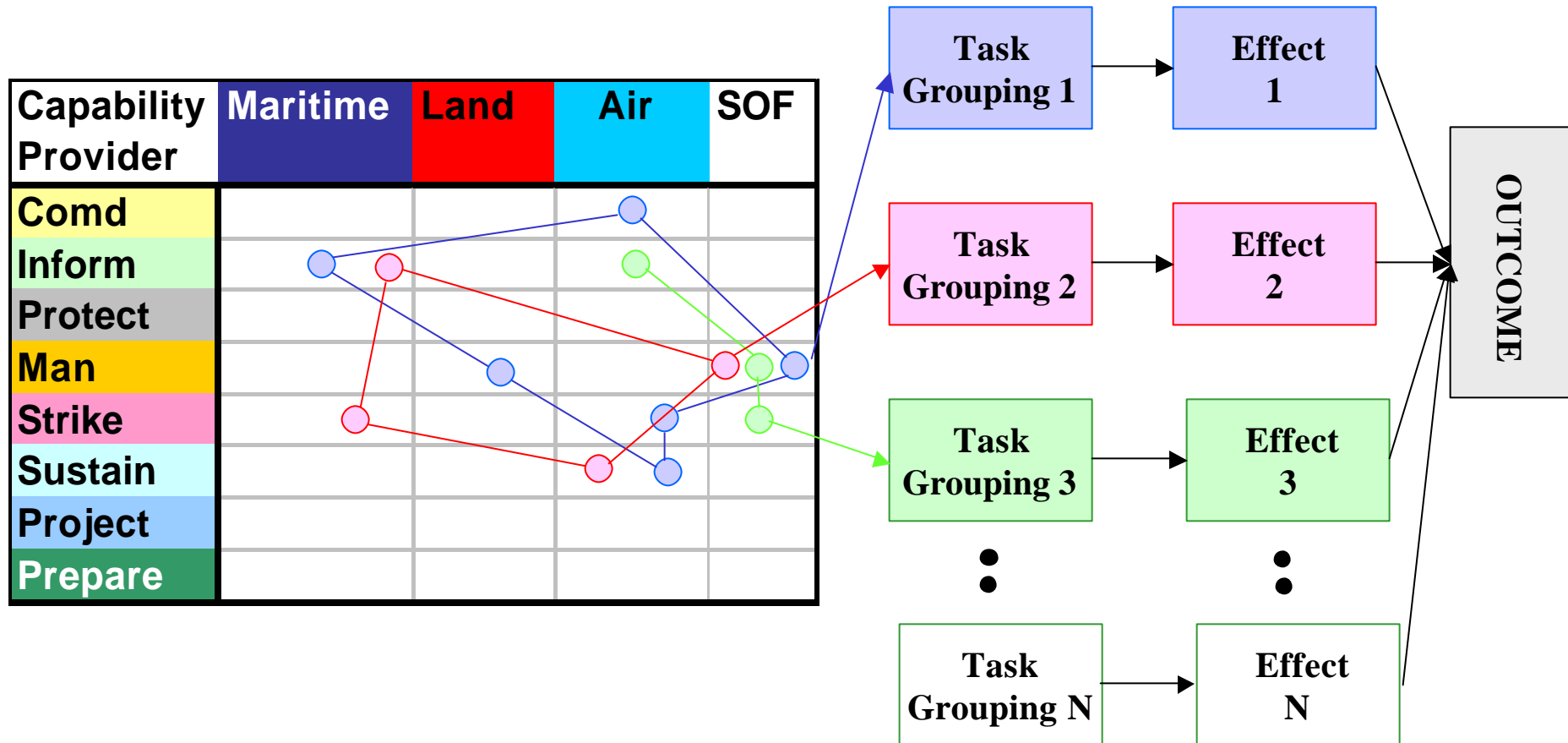


Operation Enduring Freedom: Information Sharing - Data (USMC)

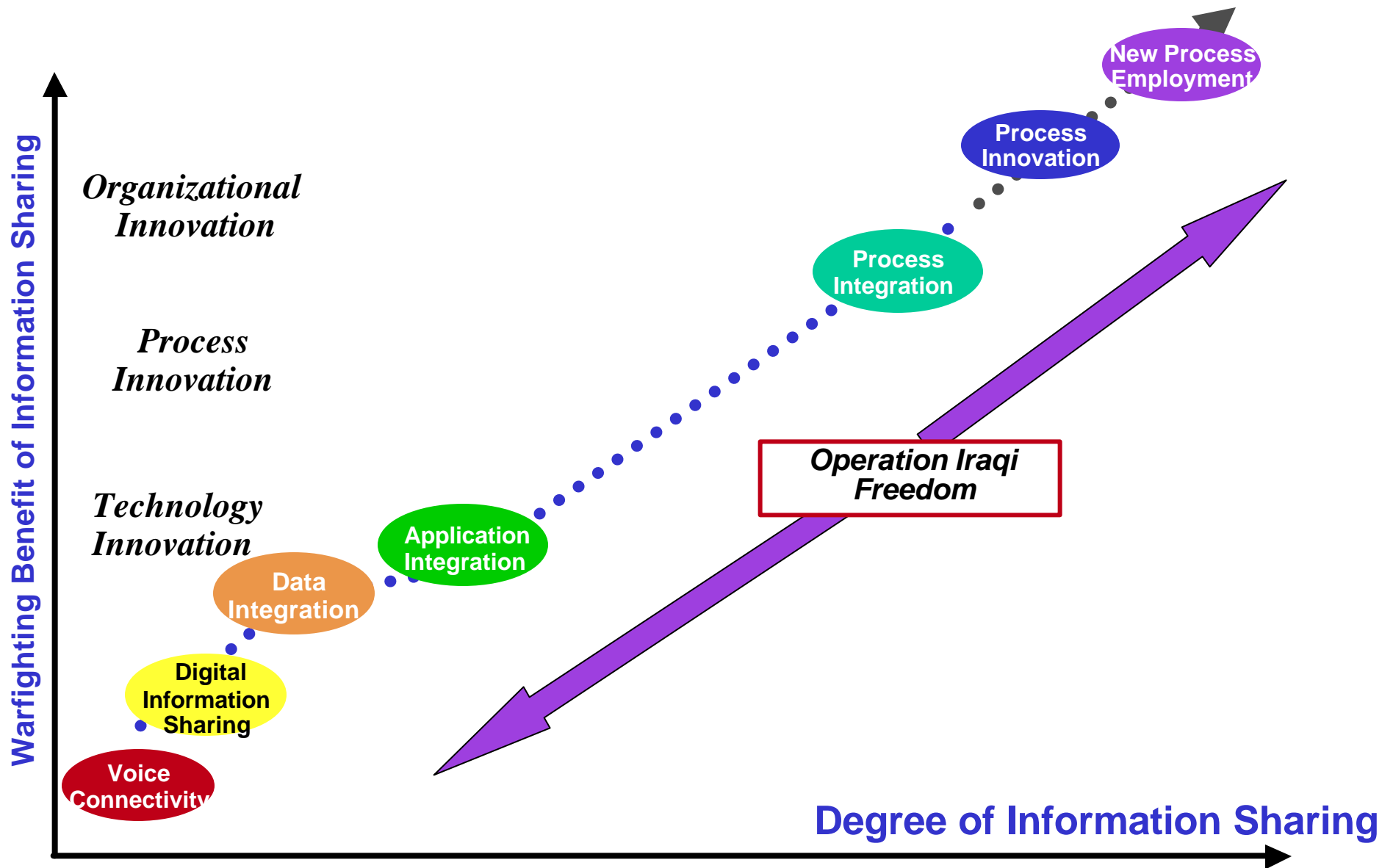


Operation Enduring Freedom: Enabling Agile Mission “Groups”

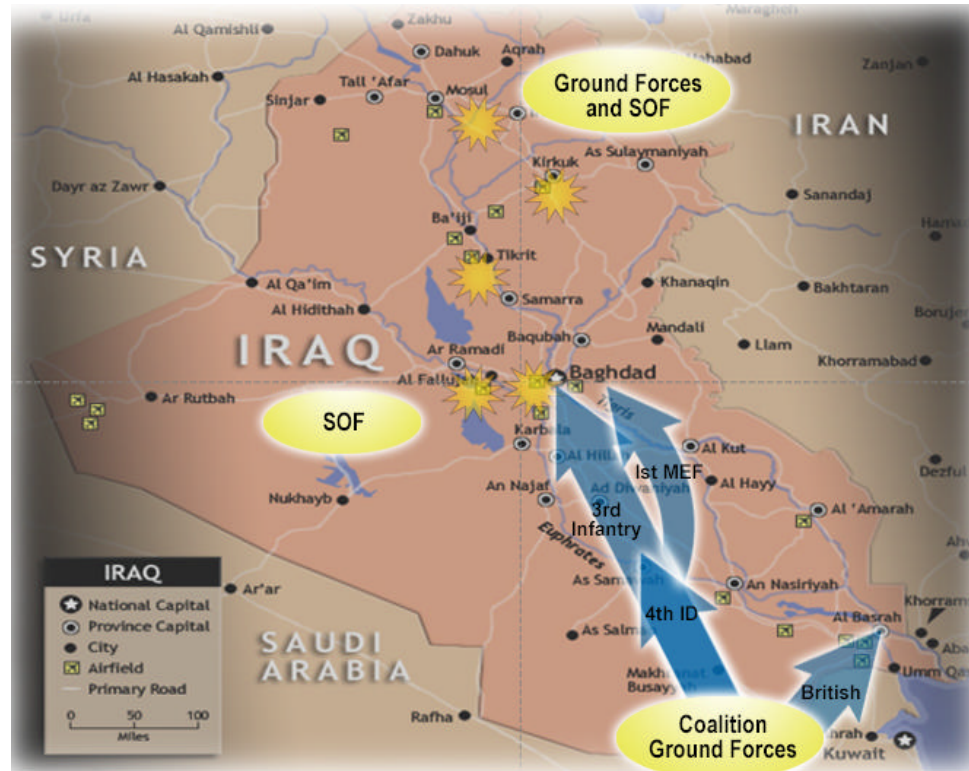
Unprecedented Tactical Agility



Combat Power as a Function of Network-Centricity



Concept of Operation: Operation Iraqi Freedom (OIF)



Three Theaters:
Southern – Center of Gravity
West – Stop scuds, monitor movements
North – Economy of Force

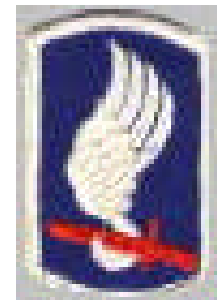
OIF: Western Iraq

- Controlled by Air Component Commander (ACC)
- Special Operation / Air Force focus
- **Non-contiguous --- non-linear**
- Robustly Networked Force
 - 100% Air Craft Data Linked
 - Ground (BFT) to ACC to Aircraft
 - Aircraft to Aircraft
 - Ground (EPLRS) to Aircraft



OIF: Northern Iraq

- Controlled by Land Component Commander (LCC)
- Special Operations, Light Forces , Airborne Drops and Indigenous Forces
- Seizer of Northern Oil Fields
 - Non linear, air-to-ground
- Non Doctrinal:
 - Special Forces C2 of light forces and armor



OIF: Southern Iraq

- Controlled by V Corps, traditional land battle w/heavy Joint & Coalition flavor

- **Very high operational tempo**

- Networking of distributed ground force commanders via SATCOM

- **Enhanced Relevant Common Operational Picture**

- Multi-echelon C2

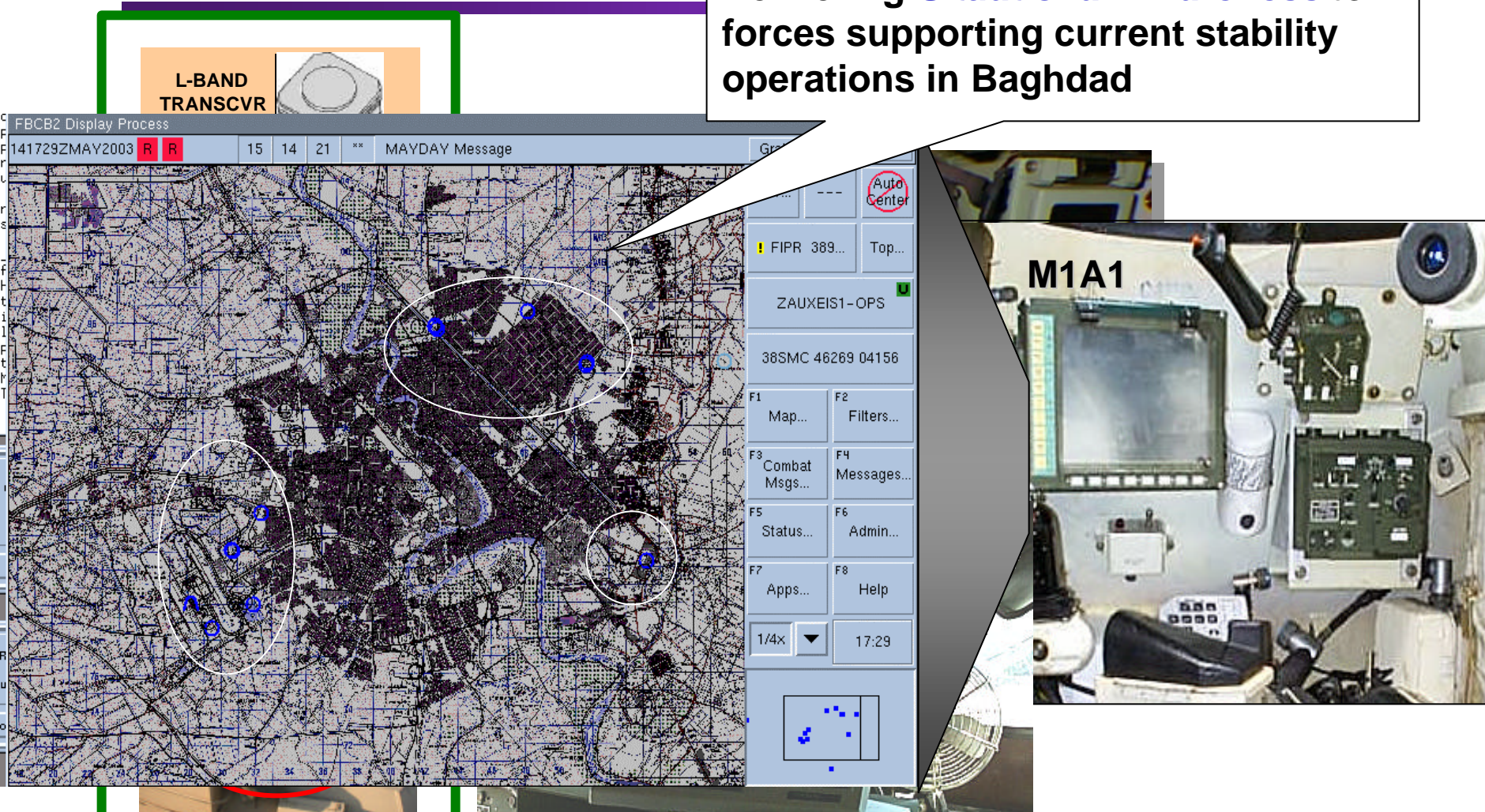
- LCC to Brigade

- Enabled by Blue Force Tracking



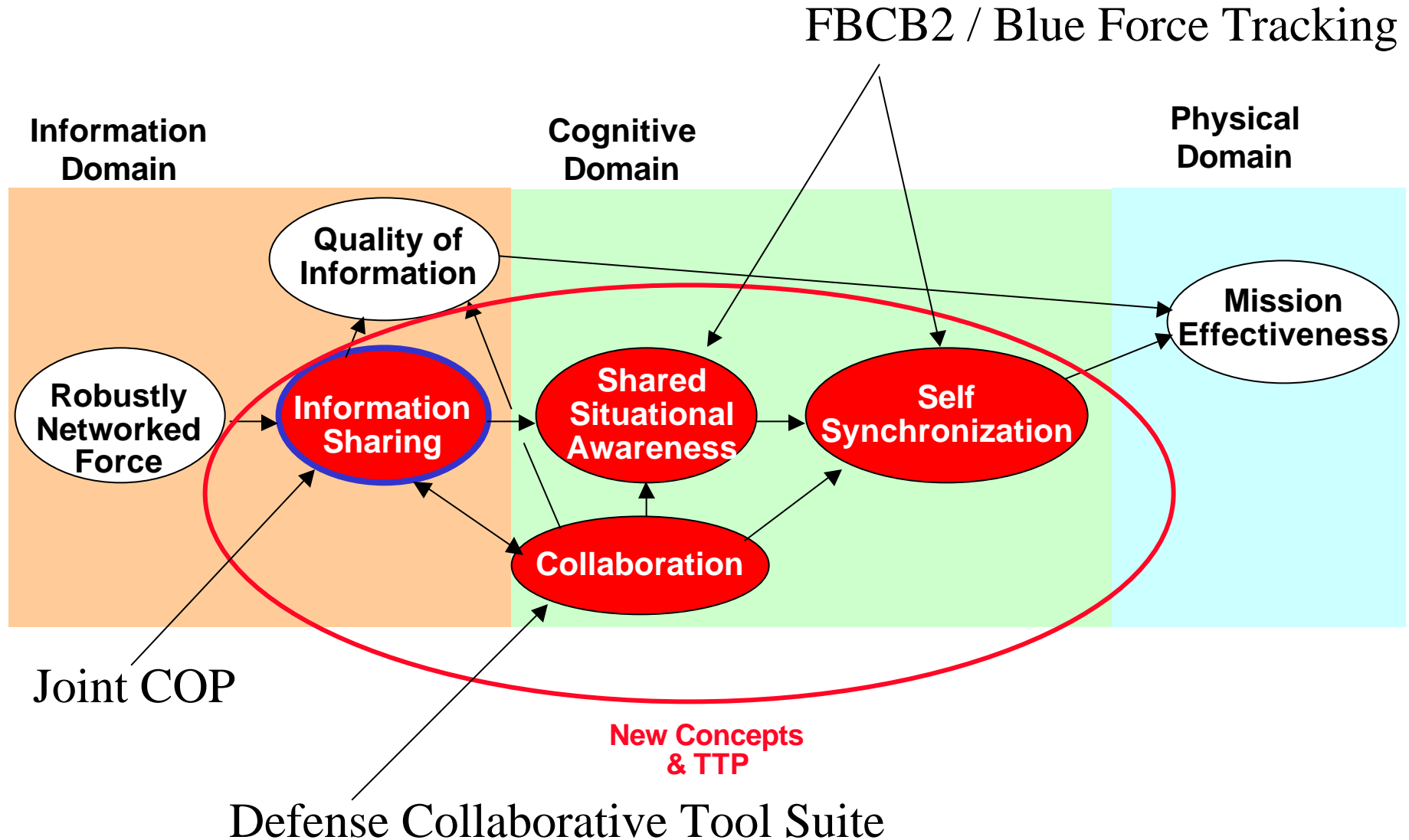
Blue Force Tracking – FBCB2

Delivering *Situational Awareness* to forces supporting current stability operations in Baghdad



“A soldier with *absolutely no training* on BFT could literally sit in front of it for 10 minutes, experiment, and have it figured out enough to get any information we needed off of it.” - 326th Eng Bn

Exploiting Order of Magnitude Change

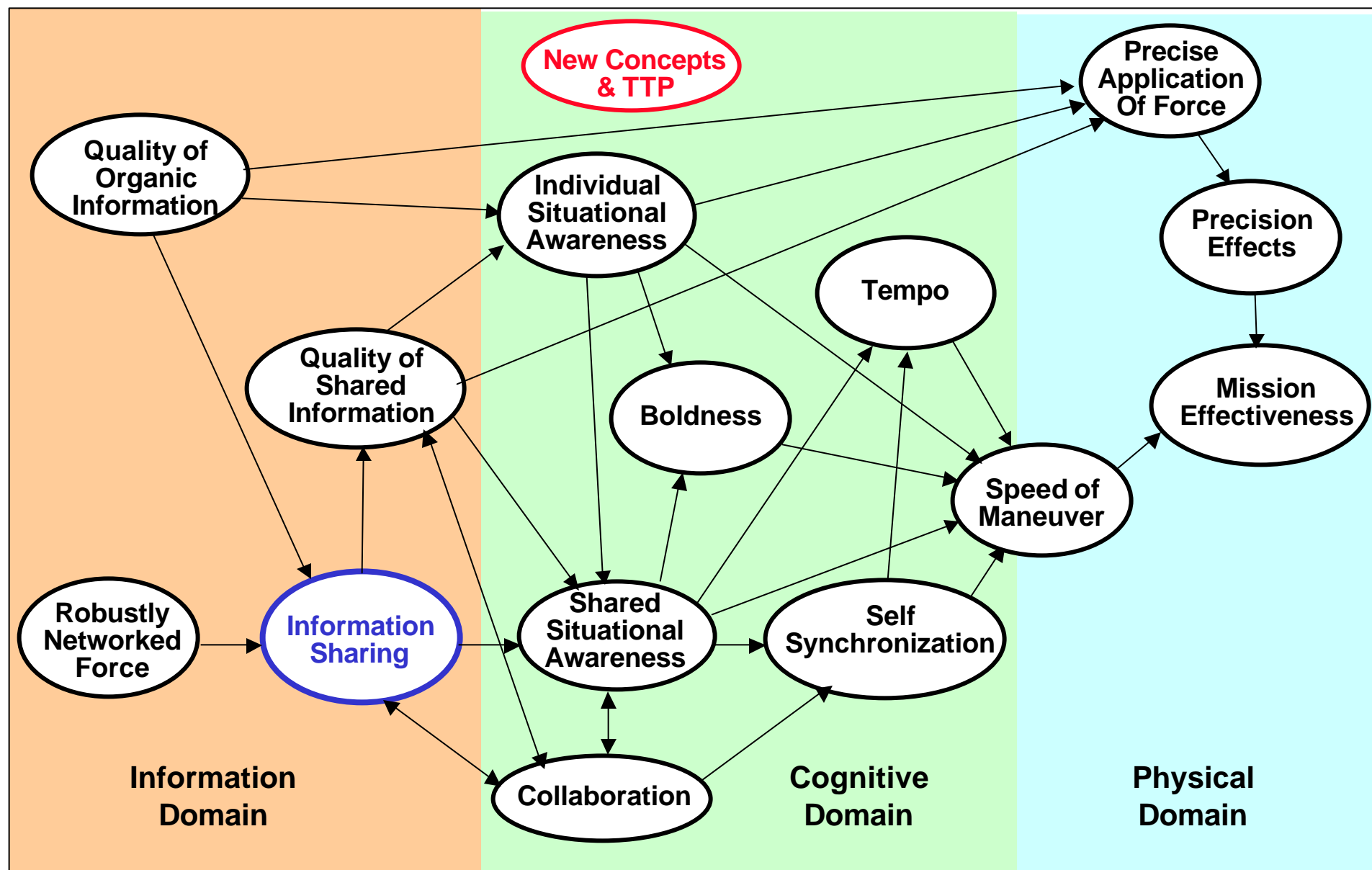


Getting the Theory Right: Command and Control of a Networked Force

What's Different?

- **“Common” Operational Picture**
 - Reduced “Fog” of War
- **Shared Situational Awareness (SA)**
 - Significantly increased SA for :
 - Commander
 - Subordinate Commanders
 - Individual Warfighters
 - Decreased “cognitive loading” in developing SA
- **Command Intent**
 - Increased shared situational understanding
 - Enhanced by capabilities for real-time collaboration
- **Enhanced Speed of Decision Making**
- **Increased Tactical Agility**
- **Reduced Risk**

Command and Control of a Networked Force



Implementing Network Centric Warfare: Key Elements of Strategy

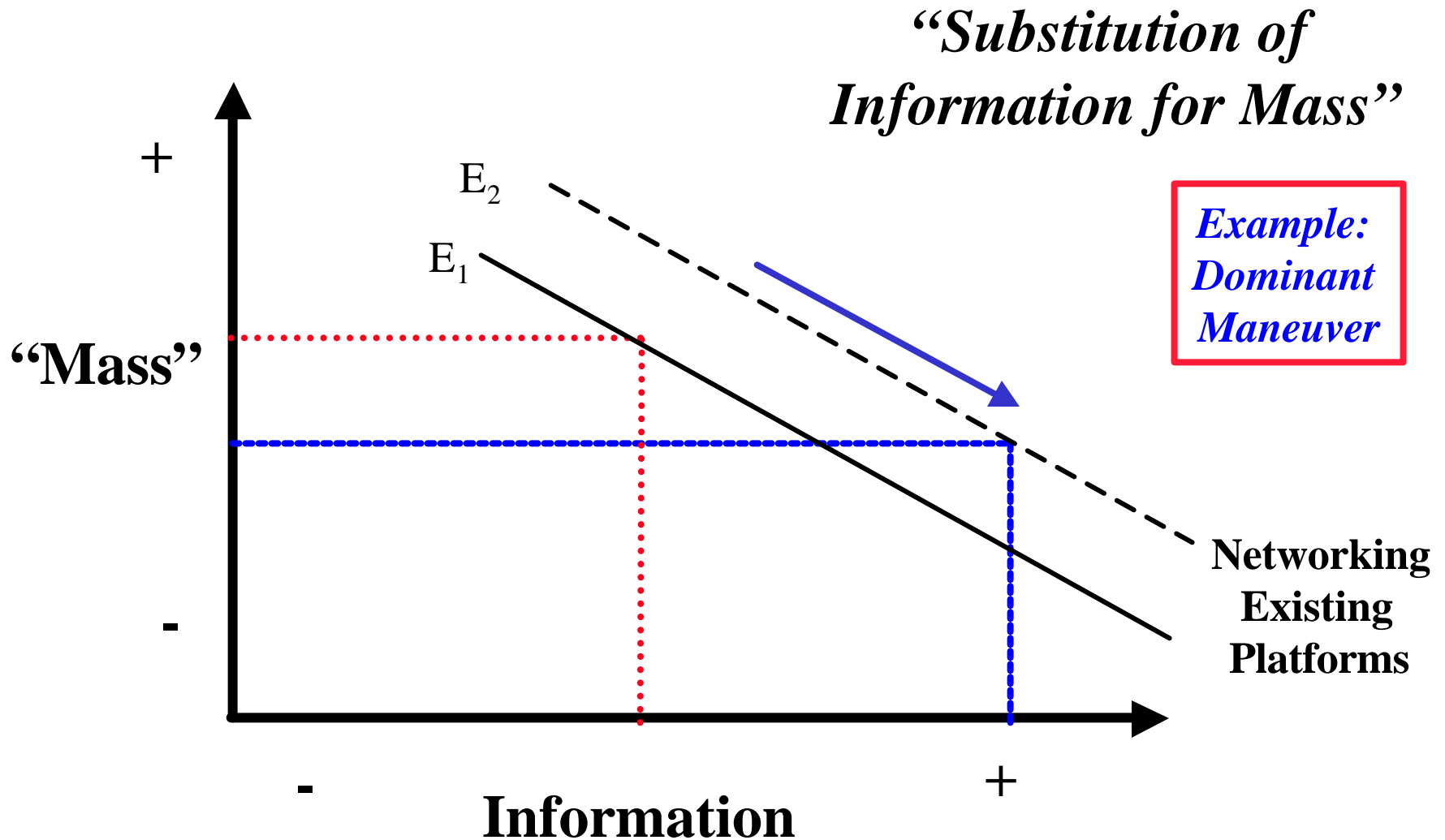
- Get the Theory Right
- Apply the Theory Enterprise Wide
- Accelerate Networking of the Joint Force
- Accelerate Deployment of Network-Centric Concepts and Capabilities
- Experiment with Network-Centric Concepts and Capabilities
- Address Challenges of Allied & Coalition NCO
- Develop Doctrine and Tactics, Techniques, and Procedures for NCO
 - Service/Combined/Joint/Allied and Coalition

Getting the Theory Right

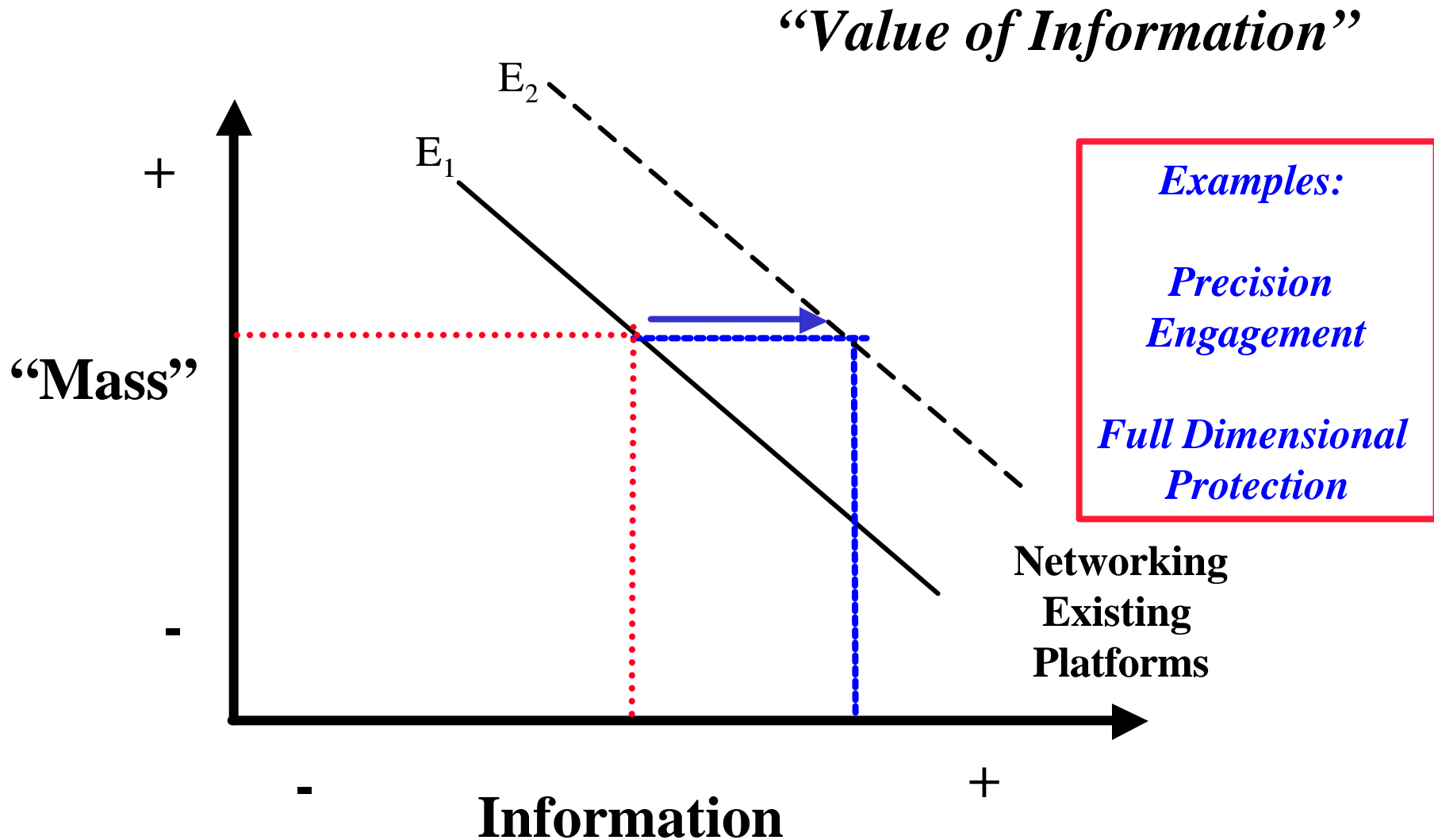
- Objective:
 - Develop and refine NCW as the Theory of War for the Information Age
- Desired End State:
 - A recognized body of knowledge that describes:
 - NCW Theory
 - Key variables and relationship between variables
 - Attributes and metrics for measuring the variables
 - Principles of War
 - Revised – upgraded as required
 - Theory of War for Information Age
 - Nature
 - Character
 - Conduct

*Focus of
NCO
Conceptual
Framework
Initiative*

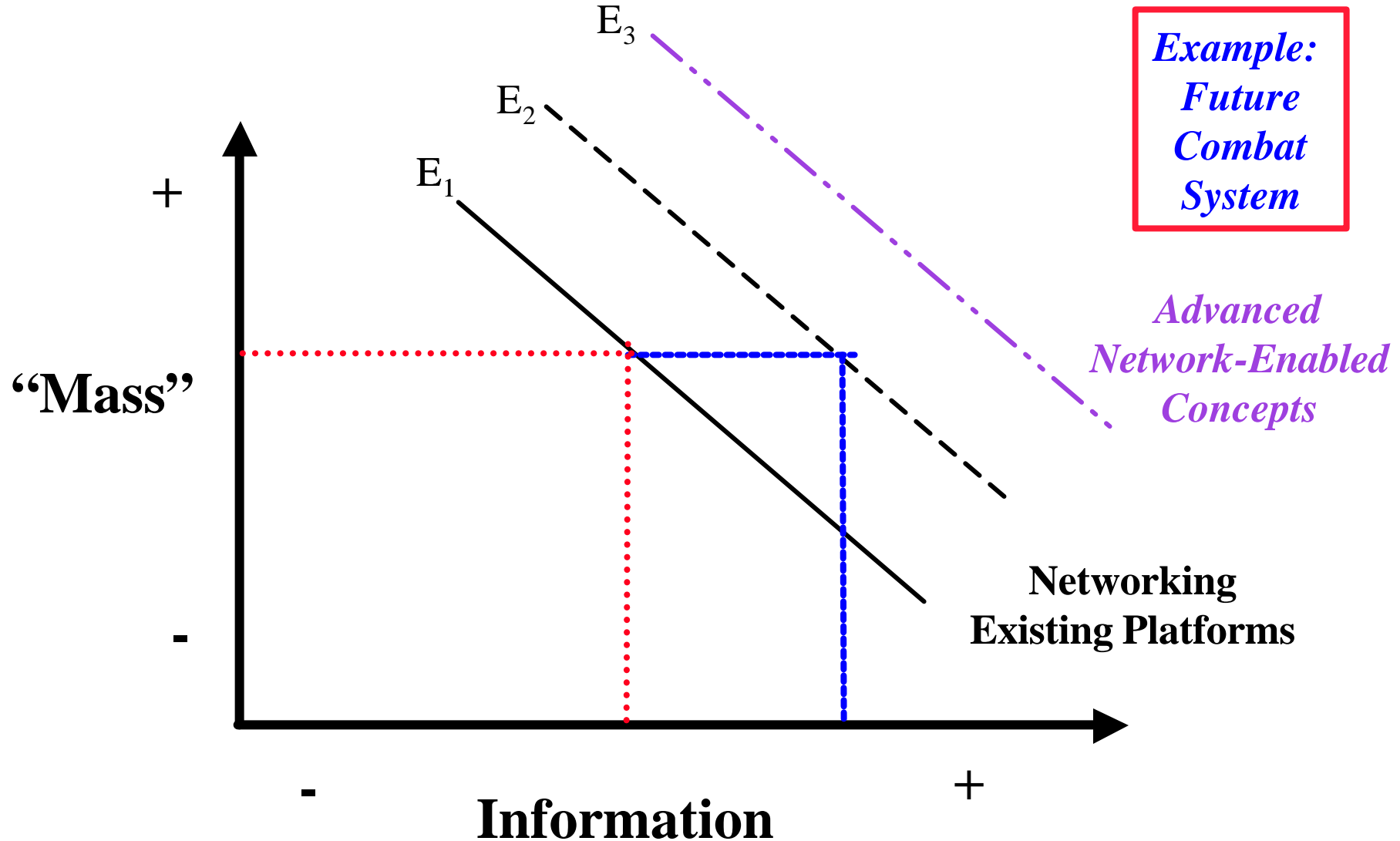
Getting the Theory Right



Getting the Theory Right



Getting the Theory Right



Example Advanced Network Enabled Concept: Sea-Based Tactical Air

Distributed Sea-based TACAIR

Network-centric

- *Collaborative planning and execution*
- *Netted expeditionary sensors*

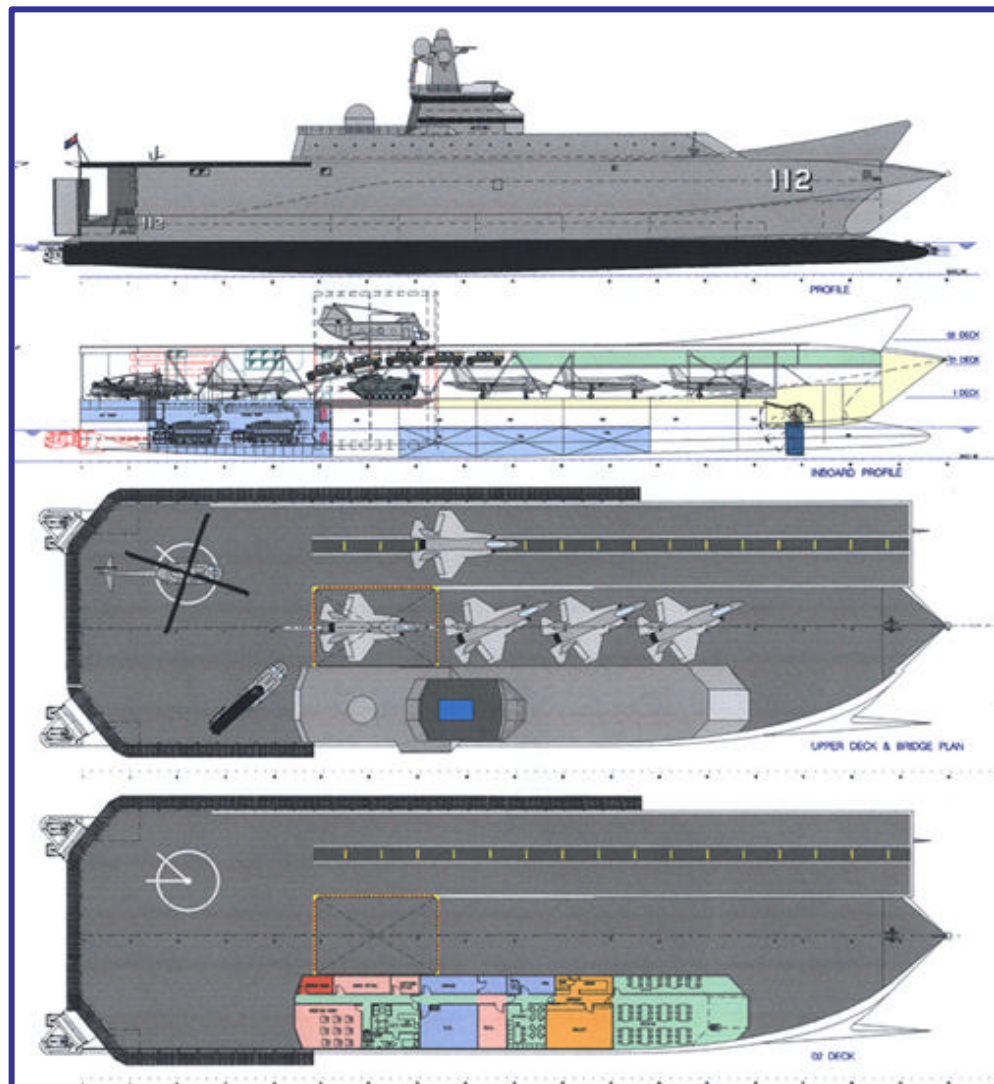
Continuous power vice pulse of power (24 hour ops)

Assured access

- *Correct tactical instability*
- *Complicate enemy ISR*
- *Improve survivability
(susceptibility/vulnerability)*
- *Reduce manpower*
- *Reduce cost*

Sea-basing implementation

- *Split operations/replenishment
AIMD ashore or ship-based*



Getting the Theory Right: Evolution of the NCO Conceptual Framework

Tenets of NCW: DoD Report to Congress on NCW (2001)

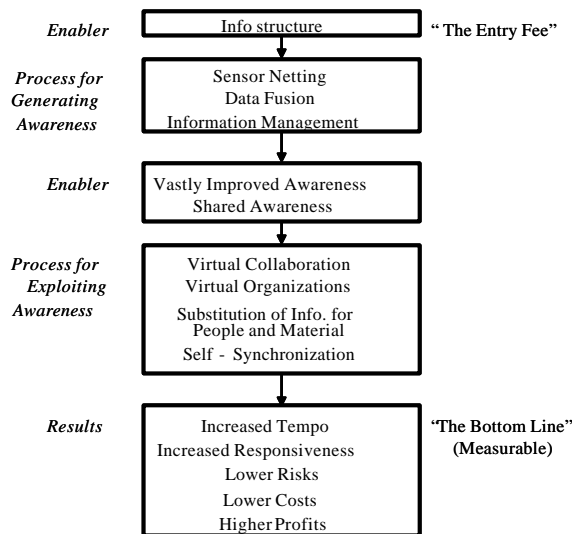
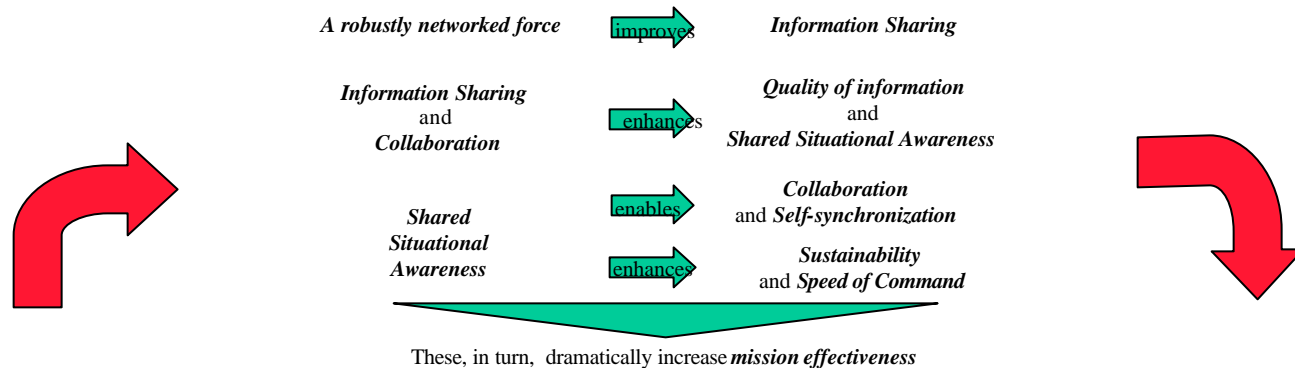
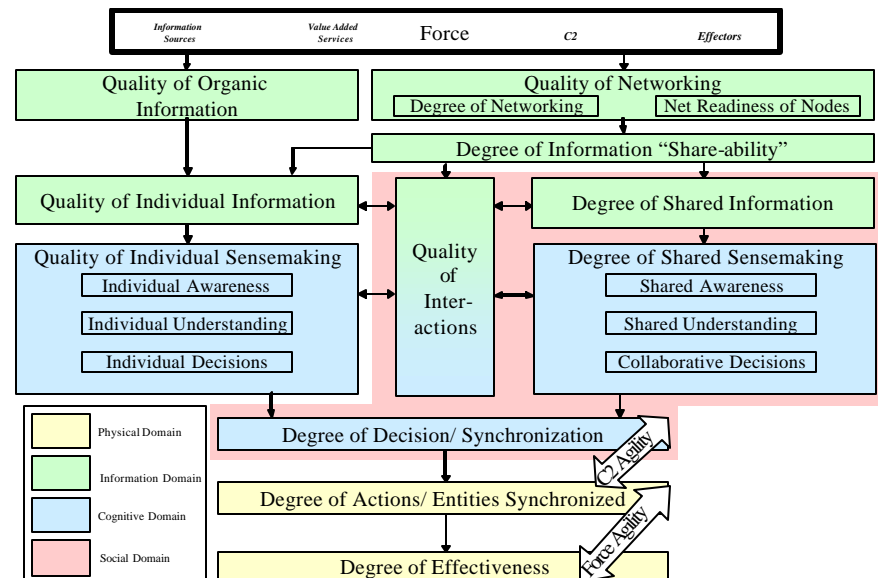


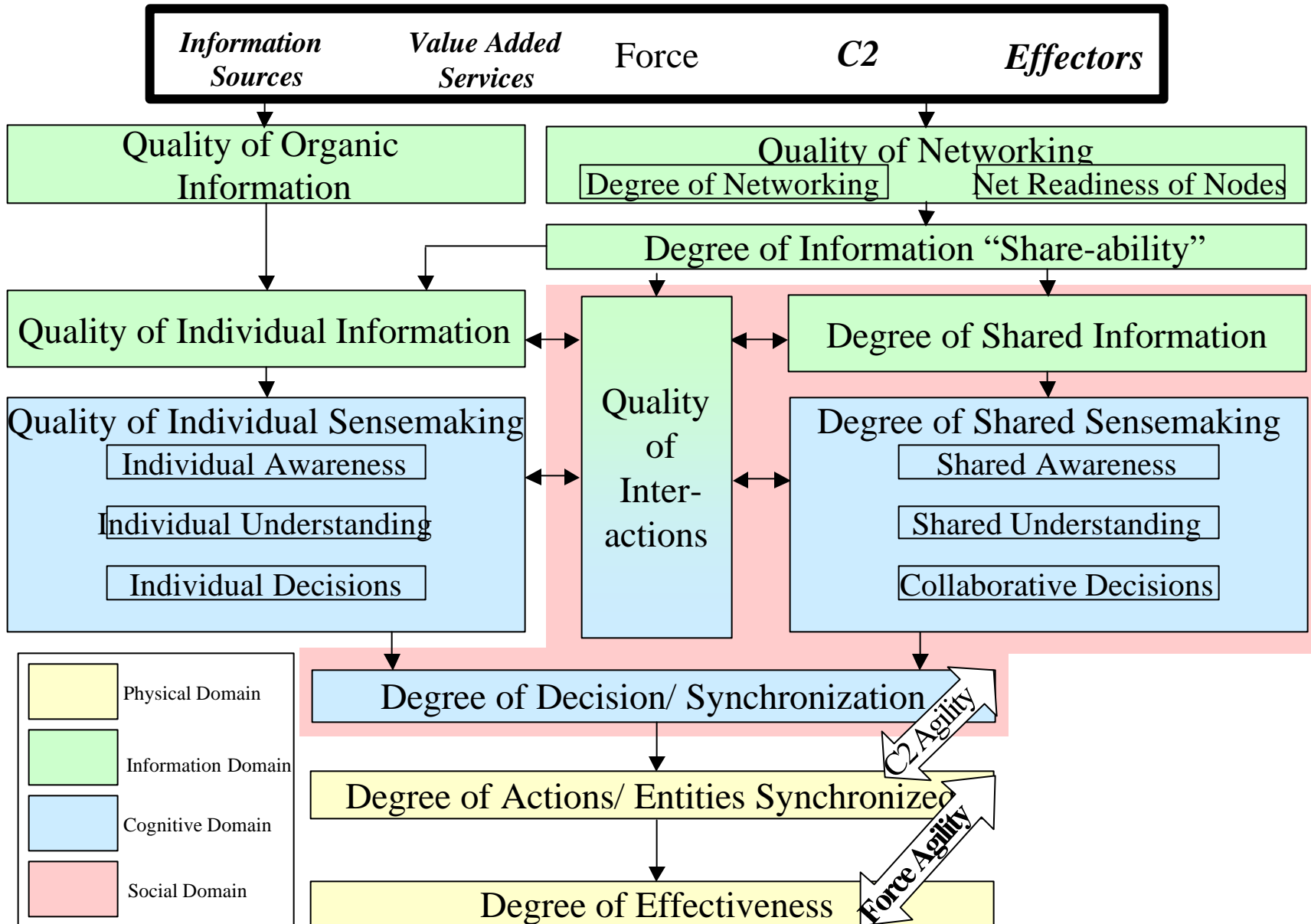
Figure 6. The Network Centric Enterprise



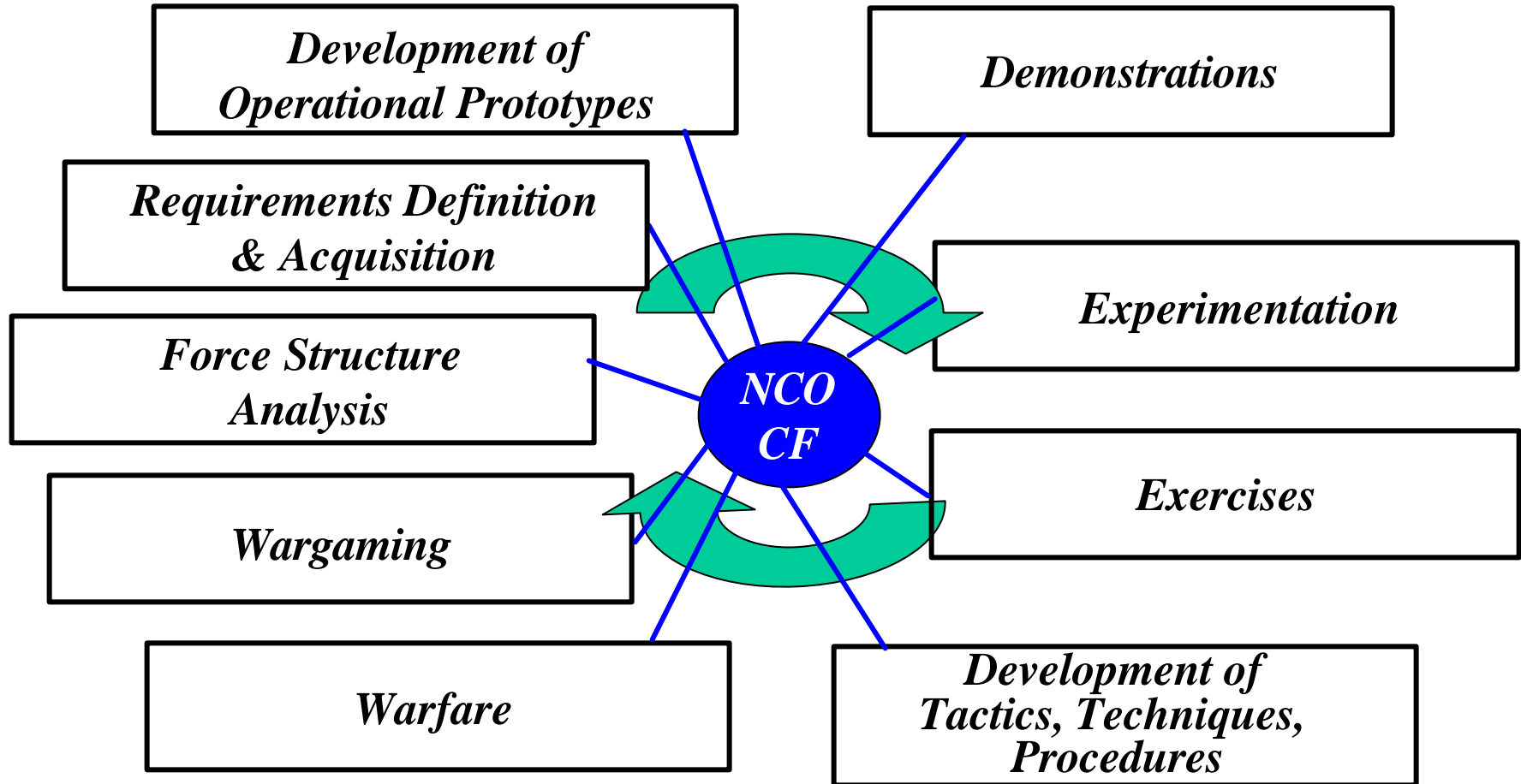
NCO Conceptual Framework (2003)

NCW Foundation (1999)

Getting the Theory Right: The NCO Conceptual Framework

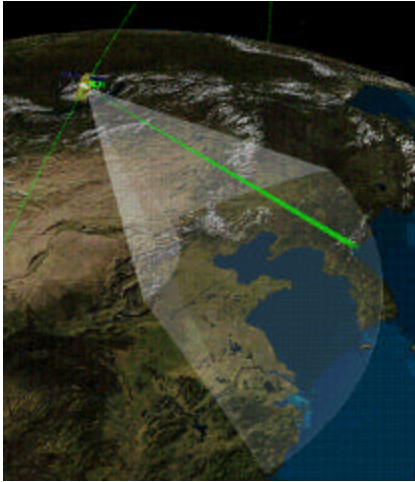


Applying the Theory Enterprise Wide

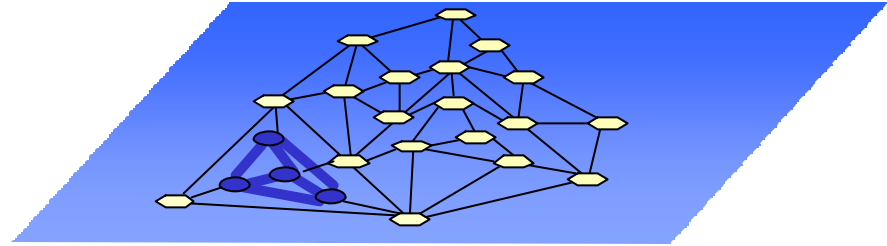


*Application of NCO Conceptual Framework will accelerate
Innovation relating to implementation of NCW*

Applying the Theory Enterprise Wide: Supporting Key Force Development Decisions

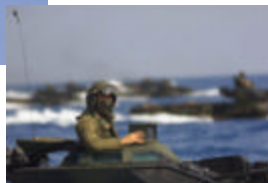


Sensors



Networks

Command & Control



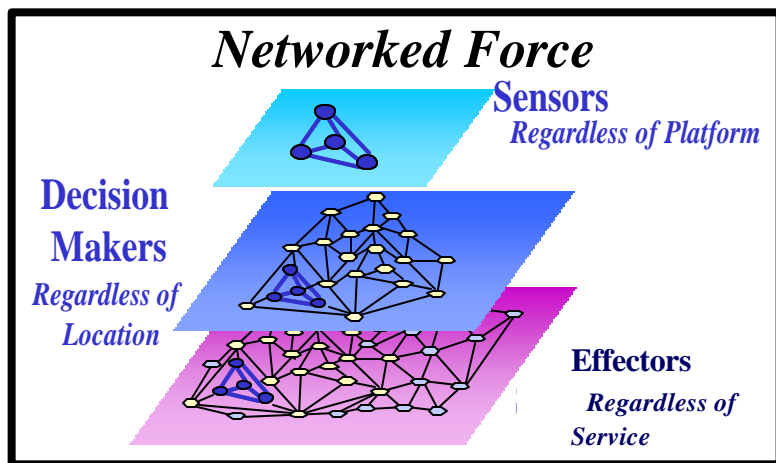
People

Effectors (Shooters)

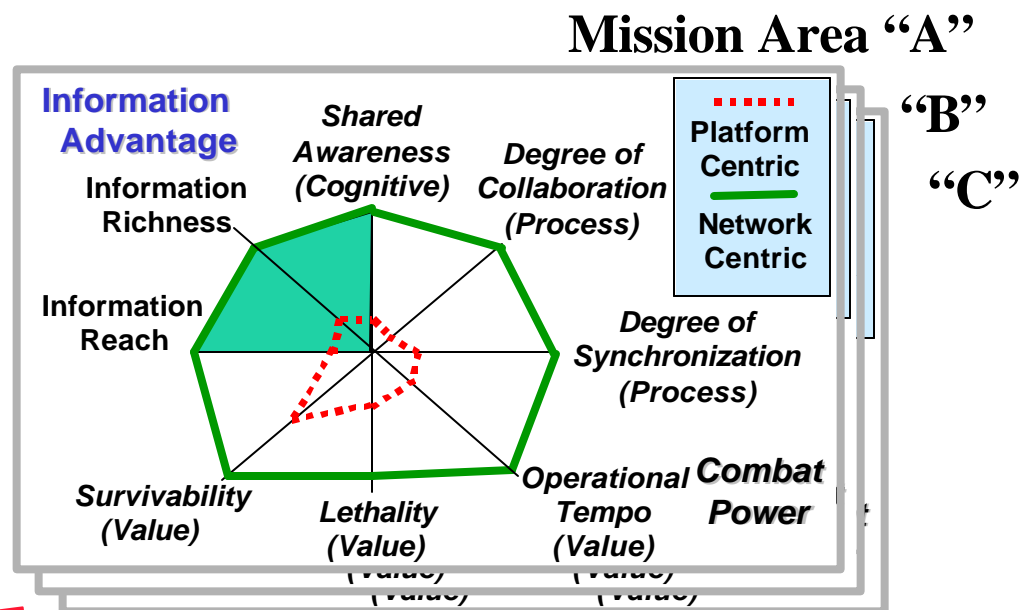


Applying the Theory Enterprise Wide: Supporting Key Force Development Decisions

Alternative Force Structures

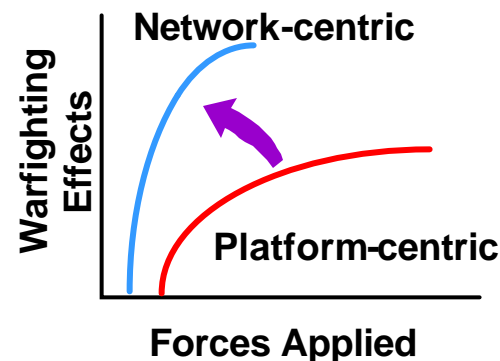


Mission Effectiveness



New Concepts
& TTP

Campaign Level Effectiveness



Accelerate Deployment of Network-Centric Concepts and Capabilities

Examples of Ongoing Initiatives and Programs

- Army
 - FBCB2
 - Blue Force Tracking
 - Future Combat System
- Navy
 - Navy Marine Corps Intranet
 - Cooperative Engagement Capability
 - FORCEnet
- Air Force
 - Network Centric Collaborative Targeting
 - Aircraft Data Links
- Joint
 - Joint Tactical Radio System

Implementation Challenges

- **Getting the Theory Right**
 - Advancement of “New Theory of War”
 - Development of new “mental models”
- **Applying the Theory Enterprise Wide**
 - Making the “Business Case” for key Enabling Investments
 - Networking + “Interoperability”
 - Sensing
- **Enabling Information Age Behaviors**
 - Dealing with challenges of Disruptive Innovation
 - Creating the right set of “Incentives”
- **Overcoming Cultural Impediments to Innovation**
 - Emergence of “New Elite”
 - Potential Displacement of “Existing Elite”

Take A Ways

- **Network Centric Warfare: An Emerging Military Response to the Information Age**
 - *Evidence exists and is compelling*
 - *Clear linkage between Information Advantage and Warfighting Advantage*
 - *Ideas and concepts have “traction”*
- **Early NCW adopters are reaping significant gains**
 - **Armed Services: Increased Combat Power**
 - **Industry: New Business**
- **A New Mental Model is emerging to navigate the ongoing Transformation from the Industrial Age to the Information Age**

Questions?

To Probe Further

- **DoD Report to Congress on Network Centric Warfare**
 - *Online at www.dodccrp.org*
- **Books**
 - *Blown to Bits* by Evans and Wurster
 - *The Innovators Dilemma* by Clayton Christensen
 - *Network Centric Warfare: Developing and Leveraging Information Superiority* by Alberts, Garstka, and Stein, *Online at www.dodccrp.org*
 - *Understanding Information Age Warfare* by Alberts, Garstka, Hayes and Signori, *Online at www.dodccrp.org*
- **Brochures**
 - *Information Superiority*: www.c3i.osd.mil/infosup/
 - *Global Information Grid*: www.dtic.mil/jcs/J6

To Probe Further (Cont.)

- Articles
 - *Proceedings of the Naval Institute*
 - “*Network Centric Warfare: Its Origin and Future*,”
by VADM A.K. Cebrowski and John J. Garstka, Jan 1998
 - Multiple articles on topic of NCW in subsequent issues
 - *Defense News*
 - “*The Future Is Networked: U.S. Must Take Charge of New Military Revolution*,” Senator Joseph Lieberman, 21 Aug 2000
 - *PHALANX*
 - “*Network Centric Warfare: An Overview of Emerging Theory*,” John J. Garstka, Dec 2000
 - *Business 2.0*
 - “*America’s Secret Weapon*,” Tom Stewart, Dec 2001
<http://www.business2.com/articles/mag/0,1640,35142,FF.html>